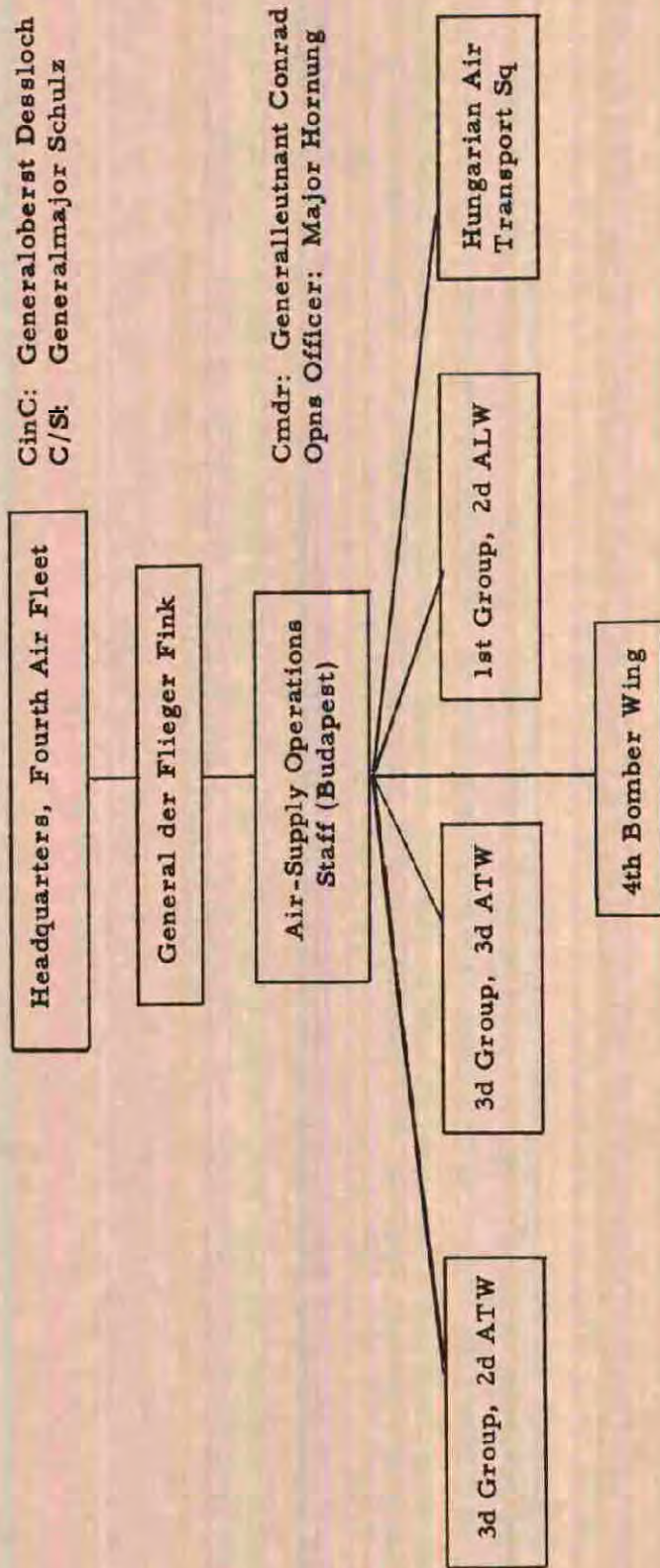


OPERATIONAL SUBORDINATION OF THE AIR TRANSPORT UNITS



Note: The 4th Bomber Wing was employed only intermittently in air transport operations, since its main mission was bombardment.

its members were almost always engaged in special missions for the Hungarian command staffs. As an example, the Hungarian command staff in Budapest submitted a requisition for 70 tons of ammunition, 100 tons of sugar, 27 tons of dried vegetables, 70 tons of butter, 50 tons of cheese, and 100 tons of canned meat and milk. All of these supplies--and this was by no means a small amount--were to be flown into Budapest by the nine Hungarian Ju-52's, an impossible task. The Hungarian squadron sometimes freed as many as two Ju-52's for the general supply missions to the encircled area, but even these were rarely available; they were usually under way to fulfill some special request for a member of the Hungarian command staff.

The available air transport space was not even sufficient to guarantee adequate supply of the encircled troops. The civilian population had apparently not been included in the planning. After the Buda section of the city was lost, there was hardly enough food on hand to take care of the population. The children had no fresh milk whatsoever, and the milk powder brought in by air was not an adequate substitute.

#### C. Airfields and Support Facilities

The Ju-52 units and the glider-tow group utilized the airfields at Papa and Steinamanger (Szombathely) as take-off bases. Both fields were adequately equipped for full utilization, although the one at Steinamanger could be used only for daylight missions. The technological facilities had been destroyed in part by enemy bombardment but had been temporarily restored to the point where they were able to meet the demands made upon them. Air traffic control facilities were available and in some cases were even effective enough to permit bad-weather operations. The unit located at Steinamanger had to fly to the Papa airfield for loading.

The 4th Bomber Wing used the airfields at Wiener Neustadt and Nowy Dwor as take-off bases. The field at Wiener Neustadt, which had been in commercial use during peacetime, was well equipped with all the necessary technological and flight control facilities and was entirely adequate to the requirements of the operation.

Aviation gasoline in the quantities necessary for the operation was drawn from the Fuehrer Reserves (administered by Feldmarschall Keitel). Fuel requisitions had to be submitted before each mission and approved by Keitel. Each aircraft was issued the amount of gasoline it would need for completion of its mission, plus a small reserve

amount for emergencies. Arrangements had been made to assure the procurement of adequate supplies of spare parts, which were requisitioned from the aircraft equipment depot at Wiener Neustadt.

Captain Thomas, the Army liaison officer, was responsible for coordinating the activity of the Air-Supply Operations Staff (Budapest) with the appropriate Army supply agencies. The encircled force reported its needs to him each day by direct radio communication, and on the basis of these reports he took the necessary action to have the requested supplies procured and transported to the take-off bases. His work was rendered extremely difficult by the fact that he was required to submit countless reports to a great many unimportant Party and civilian agencies; as a result, it was completely impossible to obtain a clear and accurate picture of the supply situation. During the last phase of the operation, the top-level command ordered the procurement and transport to Budapest of certain supply items which the encircled force neither needed nor wanted. During the night of 28/29 January 1945, for example, there arrived a closely guarded rush transport of supply containers marked "donation in honor of Himmler." During the following night, these containers, now labeled "special donation in honor of the day power was seized,"\* were delivered by air drop over the target area. The next day, Colonel Jenz, Commanding Officer of the 12th Antiaircraft Artillery Regiment, submitted a radio message protesting in the name of the troops against the contents of the containers. Thereupon one of the containers was opened by the Air-Supply Operations Staff and was found to contain canned horse meat, candy, and cigarettes. Each day hundreds of horses had to be shot and butchered within the target area because there was no fodder for them. What the encircled forces really needed were ammunition and flour.

#### D. Difficulties Encountered During the Course of the Operation

The increasing nervousness of Germany's top-level command during this period was evidenced by the assignment of an Army general and a military court staff to superintend the activity of the Army liaison officer attached to the Air-Supply Operations Staff. This measure naturally created an atmosphere of unrest, nervousness, and uncertainty

---

\* "Sonderspende, Tag der Machtergreifung."

not only among the units themselves but also among the members of the Operations Staff. It was hardly a measure which could be expected to raise the morale of the participating units; nor did it contribute to the desire to accept responsibility on the part of the Staff members. Inevitably, these high-ranking observers appointed by the top command found fault with the manner in which the operation was being conducted and insisted upon interfering on the organizational level. Their suggestions, based exclusively on theory, were nothing but a nuisance to the Operations Staff, which was quite aware of the deficiencies concerned.

The medical agencies had done everything in their power to arrange for the transport of wounded personnel out of the encircled area. However, because the transport aircraft were able to land inside the target area only during the early phases of the operation, very few wounded could be flown out.<sup>29</sup>

Because of their technological and air traffic control facilities, the airfields at Papa and at Wiener Neustadt and Nowy Dwor remained in use as take-off bases for the Ju-52 units and the bomber units respectively. Russian fighter aircraft activity in this area was very slight but this factor was balanced by strong activity on the part of the Allies, so that nearly all the air-supply missions had to be flown under cover of darkness. Enemy antiaircraft artillery and searchlight batteries were heavily concentrated along the front line of the target area, and their effectiveness was a constant and serious threat to the air-supply missions. Once the transport aircraft were caught in the searchlight beams, it was only rarely that they could manage to escape, no matter how skillfully the pilots might maneuver. The crossing of the Bakony Mountains, with the attendant danger of icing, was another factor which made the missions difficult.

The only suitable landing field inside the target area had been under artillery fire since the beginning of the operation and was soon subject to grenade fire as well. Because enemy pressure was particularly strong in this area, the defenders were forced to retreat and the airfield was given up on 9 January 1945. After this date supplies could be delivered only by air drop. The plan of landing at night on the drill field of the castle had to be abandoned after a single attempt, since the field was totally unsuitable. In order to continue transporting

wounded personnel out of the target area, all Storch aircraft\* within the Air Fleet area were mobilized. However, due to the fact that the drill field was totally unsuited for aircraft landings, they were never employed. During the operational period a total of thirty-six freight gliders (DFS-230's) landed supplies inside the target area. Because of the technological difficulties involved, no attempt was made to tow them out again.

During the operational period (lasting until 9 February 1945), 1,515.24 tons of supplies, representing a daily stint of 36 tons, were delivered to the encircled force, either by aircraft landing or by air drop. These figures, however, do not include the supplies delivered by the 4th Bomber Wing.

Personnel losses included 13 dead, 17 seriously wounded, 12 slightly wounded, and 96 missing in action. In addition, 36 Ju-52's, 7 He-111's, 1 Ju-87, 1 Do-17, and 12 freight gliders were lost. The 36 freight gliders which landed in the target area and were abandoned there must be added to the figure given above, so that a total of 48 freight gliders were lost.

At 1653 on 12 February 1945, radio communication with the target area was broken off. Later, information was received to the effect that the remainder of the defending force had succeeded in breaking out of encirclement. The next day, reconnaissance aircraft reported the presence of German troops in the woods west of Nagykovacsi. These troops were supplied by air drop by nine He-111's during the night of 14 February, and by a force consisting of nine He-111's and three Ju-52's during the following night. These were the last supply missions flown in behalf of the heroic defenders of Budapest; the drama had come to an end.

As far as technological services were concerned, the only difficulties encountered were those to be expected during a winter operation. During this period emergency measures were the rule on all sectors of the front; staff elements and units had no choice but to improvise in order to complete the missions assigned to them.

---

\* Editor's Note: A single-engine Fi-156 personnel transport and reconnaissance aircraft, which was the forerunner of the AAF "puddle jumper" or "grasshopper" liaison planes.

As regards weather conditions, the constant danger of icing was the greatest problem; this was especially acute during flights over the Bakony Mountains and the lower ranges of the Carpathians. For reasons of flight safety, aircraft crossing the Bakony Mountains had to fly at an altitude of at least 6,560 feet, and since there were always clouds at this altitude the danger of icing was always present.

Reporting requirements, in keeping with the ever increasing degree of nervousness at higher--and in fact at highest--command levels, were so exaggerated that they became a serious hindrance in the accomplishment of the missions. In addition to the standard daily reports to higher headquarters (the Air Fleet, General Fink, and the Army Group), there were any number of requests for reports within twenty-four hours to at least half-a-dozen other agencies.\*

To these were added the many reports required by the various staffs and individuals who had been granted special powers by Hitler and who had been assigned to the operational area (not, however, to the target area) in a supervisory or observer capacity. The results were obvious: the plethora of reports gathered by the Wehrmacht leaders within the space of twenty-four hours could not possibly convey an accurate picture of the true supply situation. Many of them were mere repetitions of previous reports; only two of them, those forwarded by the Air Supply Operations Staff, were systematically prepared. Under these circumstances, the agencies at the front were not in the least surprised that top-level command was thoroughly confused regarding supply tonnage and operational participation figures. Although the Operations Staff pointed out repeatedly that only the two reports released by it personally presented an accurate picture of the situation, this did little to reduce the confusion. Still another Army general was dispatched to Papa to check on the accuracy of the operational reports.

The informational reports prepared almost without interruption by members of the Operations Staff were not sufficient; the Operations Officer, and often even the Air Supply Chief himself, were continually being distracted from their work by demands for superfluous information. Transmittal of these demands, which, of course, had top-level

---

\* These included: Wehrmacht High Command; Army High Command; Reichs Leader of the SS; Commander in Chief, Budapest; Hungarian General Staff; Adjutant's Office, Office of the Supreme Commander; Reichs Leader Bormann.

priority over all communications channels, often interrupted important operational conferences. Even the Air Fleet was unable to do anything to stop them. The opinion prevailed among the members of the Operations Staff that the many high-level agencies and individuals were in a state of continual rivalry; each one was eager to bring the latest report--regardless of whether or not it was true--to the attention of the Wehrmacht top-level command. The Operations Staff was required to report take-off times and numbers of aircraft participating to Berlin in uncoded text; in order to maintain at least a minimum of security regarding the course of operations, the Operations Staff had no alternative but to submit deliberately false reports.

#### E. Conclusion

The same thing is true of the Budapest operation as was true of so many air-supply operations to encircled forces: in view of the ground situation and the lack of adequate air transport space it should never have been undertaken. It was clear from the start that the situation was hopeless. The only proper course of action would have been to abandon Budapest before the enemy had time to convert it into an encircled area. The abandonment of Budapest would not have had any detrimental effect on the over-all situation at the front. The situation at the front was grave, and Germany's leaders should have faced this fact squarely. It was ridiculous to think that the maintenance of the Budapest garrison would tie down any significant number of enemy troops; this was merely a stock propaganda phrase. The Russians had no intention of letting the need to besiege Budapest hinder them in any way in their advance towards the west.

The losses sustained by the participating Ju-52 units were particularly hard to bear at this time because they meant a further reduction in the already inadequate amount of air transport space available. At the beginning of the operation these units had at their disposal more than sixty-four serviceable Ju-52's; when operations came to an end, six weeks later, more than 50 percent of these had been lost.

The Budapest operation served further to illustrate that the leaders of the German Armed Forces were still clinging to the fallacy that air-supply operations were capable of bringing about a fundamental change in the military situation.

Section VIII: Breslau, \* Glogau, and the Last Operations in the East<sup>30</sup>A. General

The military situation during the winter months of 1944-45 was dominated by the continued advance of Germany's enemies towards the borders of the Reich, the Allies pressing forward in the west and the Russians in the east, and both forces being strengthened continually by the addition of reinforcements and the most modern weapons. On many sectors of the front the main brunt of defensive operations had already shifted to the borders of Germany. The German troops, exhausted, poorly equipped, and almost unable to move, fought stubbornly for every inch of ground in the forlorn hope that their resistance might still be capable of effecting a change for the better in the military situation.

German leaders still clung to the fallacious hope that the Rhine and Oder Rivers would present insurmountable obstacles for the enemy. There were rumors--launched by the top-level command--of completely new weapons of fantastic effectiveness which were to be ready for employment in the spring, and against which the attacker could have no means of defense. In the meantime, the enemy continued his inexorable advance. In the east particularly, the Russians had succeeded in breaking through the weakened German lines in several sectors and were carrying out extensive encirclement maneuvers. As a result, large German troop elements were completely cut off from their sources of supply. Using the supplies which they had on hand, combined with those they were able to requisition from the civilian population, some of these elements were able to hold out until they could fight their way through to their own lines; the rest were overrun by the enemy. The planned, systematic withdrawal to defensive positions began to give way to a chaos which could no longer be halted.

For the past few months the Allies had enjoyed absolute air superiority over the front as well as over Germany itself. With complete disregard for weather conditions, they had carried out heavy day and night bombing attacks against military targets and cities in all parts of Germany. Production centers, communications networks, supply storage depots, ammunition dumps, and airfields, as well as

---

\* Editor's Note: Now Wroclaw, Poland.



all populated areas, were subject to constant bombardment by the Allied air forces, and German anti-aircraft defenses were far too weak to provide adequate protection. Allied fighter and close-support units dominated the air not only over the military theaters of operations but also over the entire Reich, and were able to prevent any movement whatsoever over German highways, at least by day. The chances of committing the Luftwaffe against these forces were limited indeed. German night-fighter forces were engaged in an almost hopeless struggle against the enemy bomber units. It was futile to pit the German day fighters against the American heavy bombers, for the latter were invariably accompanied by strong fighter escorts and the losses sustained by the German units were all out of proportion to the degree of success achieved. The few German bomber units still capable of operation were restricted to carrying out their missions under cover of darkness, and even under these conditions they suffered unbearably high losses.

Enemy air activity over the Reich was also a disruptive factor in the accomplishment of air-supply missions by the few remaining air transport units. Enemy fighter and strafing units kept the take-off bases and supply depots under constant surveillance, so that if a mission were to have even a slight chance of success it had to be carried out at twilight, during the night, or during a period of bad weather. The demands made by these difficult conditions on the unit commanders, the crews, the ground personnel, the supply, and service units were extremely high. In addition, there were constant interruptions because of air-raid alarms and bombardments.

The lack of thorough training and combat experience of many of the flying personnel prevented them from being fully capable of meeting the requirements inherent in their assigned missions. As a result, crash landings and technical failures also took their toll of men and aircraft--these in addition to the heavy losses suffered as a result of enemy activity. It is obvious that in the long run these factors were bound to have a catastrophic effect on the volume of air transport space available for use.

Two other factors which created a great deal of difficulty during this period were the critical shortage in gasoline and the technical problems inherent in the transport of supplies to the take-off bases. Both factors were attributable to the heavy damages suffered by production centers and traffic networks as a result of constant day

and night bombardment by the Allied air forces.

In order to complete the picture of the conditions under which the air transport units (as well as all other Luftwaffe units) operated during the last few months of the war, we must also mention the nightmarish fear which hung constantly over the heads of all those responsible for conducting operations. The missions and the manner in which they were to be accomplished were clearly outlined in the operational orders, yet it happened often that they simply could not be fulfilled because of insurmountable technical difficulties. As far as the unit leader was concerned the accomplishment of an assigned mission was usually dependent upon improvisation and luck. However, when an assigned mission--regardless of whether or not the existing circumstances had justified its assignment--was not carried out, the responsible unit leader was subject to trial before a military court for "failure to obey orders." In these instances it was always the failure of the mission which was emphasized and not the complete lack of the prerequisites necessary to the successful accomplishment of the mission.

Fortunately, the military court committees responsible for investigating these cases were under the leadership of experienced unit commanders. Their findings invariably indicated that no one person could be held responsible for the "failure," and that it was due to external circumstances beyond anyone's control. In the confusion of the last months the required reports of action taken either were never prepared or were prepared and filed as finished business without further transmittal. The measures taken and the final disposition of the reports received the full support of the Air Fleet, the Air Transport Chief, and the Chief of the Luftwaffe General Staff; they did their best to cover up for the court committees and saw to it that the cases were never reopened.

#### B. The New Chain of Command and the Participating Units

At the beginning of 1945, the air transport forces underwent a fundamental reorganization. On 10 February 1945, the staff of the "Armed Forces Air Transport Chief, Luftwaffe High Command" was established and placed under the command of Generalmajor Morzik. The staff took over those functions previously performed by the 14th Air Corps and by the office of the General of the Air Transport Forces.\*

---

\* See above, pp. 16-17.

The staff's most important duty was to assure the profitable utilization of the little air transport space still available by assigning forces to the various air fleet commands in accordance with the urgency of military requirements.

For the first time since the beginning of the war, this reorganization brought the entire air transport system and its needs under the control of one single staff; for the first time, air transport services were administered centrally. This reorganization, one which the air transport commanders had been requesting since 1941, came too late to do any good, for, regardless of the efforts made, a fundamental change in the military situation was no longer possible. Moreover, by this time the organizational facilities available were no longer adequate to assure systematic implementation of the new requirements. The reorganization had to be carried out through the command apparatus of the air fleets. By dint of excellent cooperation between the two agencies (Luftwaffe High Command and the Air Fleet Headquarters) every effort was made to assure that the requests for air-supply services were carried out as effectively as circumstances permitted, despite the many insurmountable obstacles.

Although surface supply lines were inevitably becoming shorter and shorter, requests for air-supply services continued to increase. This was due chiefly to so much materiel being lost during the course of the almost daily evasive actions and withdrawal operations. In addition, surface supply lines to the fighting fronts were often disrupted by enemy bombardment or destroyed by fighter-bomber attacks.

During the last few months of the war, only six groups of Ju-52's, one air transport group of He-111's, two bomber groups of He-111's and one long-range air transport group of Ju-352's were available for operations.\* In addition to fulfilling the regularly received

---

\* These groups were: 1st Group, 1st Air Transport Wing (Ju-52's) under Major Schmidt with headquarters at Tutow; 2d Group, 2d Air Transport Wing (Ju-52's) under Captain Harnisch with headquarters at Senftenberg; 3d Group, 2d Air Transport Wing (Ju-52's) under Major Reimann with headquarters at Dresden-Klotsche; 1st Group, 3d Air Transport Wing (Ju-52's) under Captain Matschulat with headquarters at Senftenberg; 2d Group, 3d Air Transport Wing (Ju-52's) under Lt. Col. Baumann with headquarters at Werder; 3d

requests for air-supply services, these units were expected to devote special attention to supplying the fortresses of Breslau and Glogau. Breslau, in fact, was to receive top priority for air-supply services.

### C. Accomplishment of the Mission

As early as 7 February 1945, when it became apparent that the city of Breslau was threatened with encirclement by the enemy, orders were received to increase air-supply services to that area. When the city was finally surrounded and completely cut off from surface supply channels, air-supply missions took on the character of a supply operation to encircled forces.

There were approximately 45,000 troops and 250,000 civilians trapped in the city. Because of the total inadequacy of the volume of air transport space available there was no point in establishing a daily delivery goal--figures of this sort would have had no practical value. There were sufficient supplies of food and clothing on hand in the city, so that the transport forces could concentrate on bringing in ammunition of all types, weapons, and equipment for the Army and the Luftwaffe.

The air-supply missions were carried out by both Ju-52 and He-111 units, the former utilizing the airfields at Jueterbog and Dresden-Klotsche as take-off bases, and the latter the field at Koeniggraetz. These airfields were almost the only ones left which could be used for missions of this sort, for they lay in the immediate vicinity of Army equipment depots and ammunition dumps, making the distance to be covered in transporting supplies to the take-off bases as short as possible (a longer transport route would have presented insurmountable difficulties at this stage of operations). An Army supply staff was appointed to take charge of the procurement, transport, and loading of the requisitioned supplies, and a Luftwaffe officer from the air

Group, 3d Air Transport Wing (Ju-52's) under Major Pinkert with headquarters at Finsterwalde; 30th Air Transport Group (He-111's) under Lt. Col. Klamke with headquarters at Klein-Welzheim, Reichenbach, Neubiberg and Salzburg; a long-range air transport group (Ju-352's) under Major Maus with headquarters at Tutow; two groups from the 4th Bomber Wing (He-111's) under Major Graubner, with headquarters at Koeniggraetz.

transport forces was assigned to work closely with this staff in order to assure that loading and weight regulations were complied with.

The supply flights, all of which had to be carried out during the night, were further complicated by the weather conditions, which made the greatest demands on the flying personnel. The sudden dense fogs which were typical of the take-off area during this season of the year required an extremely high degree of skill on the part of the pilots.\* In many cases it was simply irresponsible to send pilots out on missions under these circumstances because their standard of training was wholly inadequate to the demands involved. Navigation was also a serious problem, for the narrowness of the operational area sharply reduced the usefulness of airborne direction finding equipment, particularly at night. However, if weather conditions were even reasonably fair there was little chance of a pilot's failing to identify the target area, for the combat activity was clearly visible from the air.

Breslau, which had been declared a fortress, was becoming the focal point of a large-scale battle. Since the enemy was not content with encircling the city, but was bent upon occupying it, a great many enemy forces were concentrated in the area. Recognizing, quite correctly, that regular air-supply operations would be capable of maintaining the fighting power of the encircled force at least to some extent, the Russians made an all-out effort to disrupt air transport activity by means of strong antiaircraft defenses. Antiaircraft artillery of all calibers, as well as searchlight batteries, were concentrated with particular density around the Gandau airfield, directly east of the city. Any aircraft, regardless of the direction from which it approached the field and regardless of whether it cut its motors at high altitude and glided in for a landing or tried to come in at hedge-hopping altitude, was soon caught in the cross-beams of some thirty searchlights and subjected to concentrated fire.

---

\* These difficulties were further complicated for the He-111 units by the tremendous differences between weather conditions in Bohemia (their take-off base) and Silesia (the target area), occasioned by the intervening Riesengebirge, which acted as a natural weather barrier.

On the ground there were additional obstacles to be overcome. The landing strip itself was under constant artillery fire, since the Russian main front lay only a half mile from the edge of the field. The unloading of supplies, and the loading of wounded personnel for the trips back, had to be carried out under constant enemy fire and with the help of improvised lighting arrangements. A special airfield detail\* had been flown into the encircled area to supervise these operations. In addition, there was a Luftwaffe liaison officer† assigned to the staff of the fortress commander.

The only alternate airfield which could still be utilized by the air transport units was the one at Friesenwiese, near the Jahrhunderthalle. This field was approximately 2,600 feet long and 1,300 feet wide, but because of the natural barriers blocking the approach and take-off routes it could be used only in emergency and then only by the most skillful pilots. As a result, it added little to the capacity of the area to accommodate aircraft, especially since ground antiaircraft defenses were heavily concentrated in this area.

Realizing that they might lose the only suitable airfield--the one at Gandau--at any time, on 7 March 1945 German leaders ordered that work be begun to broaden the Kaiser Strasse in Breslau so that it could be used as an emergency landing strip. The resulting strip, approximately 2,600 feet long and 165 feet wide, was never actually used by the air transport units. Because of the many fires inside the city, and the almost constant pall of smoke covering it, it would hardly have been possible to land on the Kaiser Strasse at night. Even so, the work necessary to complete it was not in vain; it was utilized in late February (before it was even finished) by freight gliders landing a battalion of paratroopers to strengthen the garrison. The gliders, of the DFS-230 and Go-242 types, were towed by He-111's and were released at an altitude of from 6,560 to 7,200 feet over the target area, some of them landing at the Friesenwiese field and the rest in the Kaiser Strasse. As they glided in for a landing they were picked up by the Russian searchlights and were subjected to heavy fire. These landings inside the fortress were carried out under the most trying conditions imaginable, and their successful completion must be viewed

---

\* This was first commanded by Major von Friedeburg and later by Generalleutnant Kalepke.

† Captain Koerner, from the air transport forces.

as a remarkable example of skill and determination on the part of the glider pilots.

In the final analysis, however, all of these operations were desperate last resorts; viewed objectively, they had no tangible justification whatsoever. There was absolutely no chance of preventing the capitulation of the city by the employment of the air transport units; it was merely postponed for a short while, but at a tremendous cost in personnel and materiel.

As the defense of the city progressed, Hitler ordered that all military authority (and this, of course, included authority for the tactical conduct of operations) be transferred to the person of Reichs Commissioner of Defense and Gauleiter (District Commander) Hanke, whose headquarters were still inside the encircled area. Hanke, who was either unable or unwilling to evaluate or even to visualize the overall situation and who was completely incapable of appreciating the limitations of the air transport forces, made air-supply operations even more difficult by his constant radio complaints and distortions of the situation to Hitler's office. Investigation and refutation of these complaints added an additional burden to the already overworked staffs responsible for the air-supply missions. Court investigations, reports, and justifications naturally had a depressing effect on both the staffs and units; they were not, however, able to increase the degree of operational readiness among the units, to raise the morale of the flying personnel, or to affect the degree of personal responsibility already felt by the staffs.

To illustrate the situation: on one occasion orders were given to fly twenty-eight infantry howitzers from Jueterbog to Breslau. After a great deal of work, the agencies concerned succeeded in effecting the necessary preparations for the mission. After the weapons had been dismantled in the standard fashion, it was found that they still would not fit into the Ju-52's; thus, they had to be dismantled even further, and this operation had to be carried out by highly specialized personnel. These personnel, however, were not readily available. In the meantime, the Air Transport Chief was busy trying to mobilize the necessary air transport space (240 missions by Ju-52's, requiring a total of 480 tons of aviation gasoline). A routine check with the encircled force revealed that it already had no fewer than fifty infantry howitzers on hand. These weapons were of no use, however, because there was no ammunition available for

them; urgent requests for ammunition had already been submitted. Although the matter was investigated, it was impossible to determine the source of the order for the twenty-eight weapons. The above example illustrates clearly the organizational chaos under which this mission--and probably a great many others--was carried out, if indeed we can consider this chaos to have anything whatsoever to do with organization.

Once the territory south of Berlin was lost, the air-supply operations for Breslau quickly came to an end because of a lack of supplies to be transported and of aviation fuel with which to transport them; they were discontinued entirely at the end of April. In early May, the fortress ceased to resist, and soon thereafter it was occupied by the enemy.

#### D. Some Statistics

No figures are available regarding the total volume of supplies flown in during the course of the air-supply operations. It is an established fact, however, that approximately 165 Ju-52's were lost as a result of enemy action, weather-induced crashes, and technical failure. Official operational reports for one group, the 2d Group, 3d Air Transport Wing, may be used as a basis for estimating the scope of the over-all operation.

During the period from January 1945 until the capitulation of the city, this group flew a total of 566 missions, during the course of which the participating aircraft delivered 657 tons of supplies and 3,770 troops. This group also evacuated 3,282 wounded personnel from the encircled area. In the course of these operations, the group lost 21 dead, 23 wounded, 84 missing in action, and a total of 52 Ju-52's.

Unfortunately, we have no documents indicating the volume of supplies delivered (all of them by air drop) by the 1st and 3d Groups, 4th Bomber Wing, based at Koeniggraetz.

#### E. Some Additional Air-Supply Missions Toward the End of the War

In addition to the air-supply operations for the city of Breslau, which we have already discussed, and the secondary missions carried out to the encircled forces at Glogau, where supplies were dropped by



the He-111 units, the following air-supply missions\* were carried out during the same period:

- 1) Air-supply operations to Posen<sup>f</sup> (22 January through 23 February 1945).
- 2) Air-supply operations to Schneidemuehl<sup>ff</sup> (early February 1945). These missions were of very short duration, since the encircled force was able to break out, at least in part, and to reach the German eastern front.
- 3) Air-supply operations to East Prussia and Courland\*\* (late January through late April 1945). These missions were restricted to urgently needed materiel, which was flown to Koenigsberg (Kaliningrad) and Heiligenbeil (Mamonovo).
- 4) Air-supply operations for the assault group under the command of General von Tettau. Carried out at night, these operations were discontinued as soon as the group (some 25,000 men) was able to reach the island of Wollin (Wolin).
- 5) Air-supply operations to isolated troop units and assault groups in the west (Sauerland, the Taunus and Harz Mountains, and Central Germany).
- 6) Air-supply operations to Berlin.

After the encirclement of Berlin, an attempt was made to supply the troops fighting in that city with ammunition and other urgently needed equipment from northwestern Germany. During the course of a conference called on 17 March to discuss the possibilities of an air-supply undertaking, General Reinhard, commander of the fortress of Berlin, presented a demand for the delivery of 500 tons of supplies daily. The air transport officers present at the conference viewed this figure as utterly fantastic, as a figure which showed that

---

\* The situation and conditions under which they were performed were approximately the same as those during the Breslau and Glogau operations.

<sup>f</sup> Editor's Note: Now Poznan.

<sup>ff</sup> Editor's Note: Now Pila.

\*\* See note above, p. 70.

General Reinhard had no conception of the true situation. In order to meet this demand 250 Ju-52's would have to land in Berlin each day, and the total number of Ju-52's available at this time was only 250. Approximately 1,000 tons of aviation fuel would have been necessary to carry out the requisite number of missions, whereas the entire Luftwaffe had a fuel allocation of only 800 tons at this time. For these reasons the project never left the stage of theoretical planning--and even in theory all the prerequisites normally considered necessary were lacking. A single attempt, carried out on 16 April 1945, proved beyond any doubt that the undertaking was utterly impossible. In spite of this fact, isolated missions to deliver supplies to Berlin by air drop or by aircraft landing in Berlin were flown until 3 or 4 May 1945.

Until late March 1945 the main focus of air-supply operations lay in the area covered by the Sixth Air Fleet. It was not until Germany was divided into north and south defense zones that the activity of the air transport units was shifted to the jurisdiction of the Air Fleet Reich. The air-supply missions carried on after March 1945, however, no longer had any tangible value; they helped to raise morale, but that was all.\*

A typical characteristic of the last few months of the war was the extreme nervousness on the part of the Supreme Command. This resulted in uncertain, somewhat ambiguous orders which, needless to say, weakened the morale of subordinate troop staffs and added to their burden of responsibility.

The requests for air-supply services submitted by the Army had exceeded all bounds and were impossible to fulfill. At all levels of command, including the very highest, there was no thought of the critical shortage in aviation fuels and in air transport space. These command agencies also failed to consider that the territory not yet

---

\* See Appendix No. 2 for a chart showing the strength, location, and chain of command of the air transport forces as of 25 April 1945, the date which marks the end, for all practical purposes, of German air transport operations. Operations and changes occurring between this date and Germany's final capitulation were only minor ones. The aircraft strengths indicated in the chart cannot be taken at face value; the majority of the aircraft were not serviceable, and could not have been made so without overcoming tremendous difficulties.

in enemy hands had shrunk to very narrow proportions.

In spite of their heavy losses and the tremendous difficulties which plagued them during the final months, the Air Transport Forces managed to continue minor operations until the very last day of the war.

## Chapter 5

## OPERATIONS IN THE WEST, 1944-1945

Section I: The Operation on the Hohe Venn,\* 17 December 1944<sup>1</sup>A. General

The last significant employment of German Air Transport units in an offensive action occurred at the beginning of the German thrust through the Ardennes in December 1944. Although this was not an airlift operation, like the other undertakings described in this chapter, it is included here because it took place so late in the war, in contrast to other, somewhat similar operations, and was plagued by some of the same difficulties which beset German Air Force operations during this period.

The Ardennes offensive represented a last desperate attempt--using all available personnel and materiel reserves--to break up the enemy's front in the West and to achieve a breakthrough with a large armored force south of the Hohe Venn in the direction of Liege. The ultimate objective of the operation was the recapture of Antwerp, which would have enabled the Germans to cut off the American troops in the Aachen area from their source of supply and thus to destroy them.

In order to provide cover for the right flank of the armored force, advancing from the Eifel plateau, a parachute group under the command of Lt. Col. Friedrich August Freiherr von der Heydte was ordered to occupy the area lying south of the Hohe Venn and east of Mont Rigi and to block the highway between Eupen and Malmedy, so that the enemy would be unable to advance towards the south from the Aachen area. This action was to take place at the beginning of the offensive, after intensive artillery bombardment of the highway. As soon as the ground-assault force had advanced as far as the Ambleve River, near Stavelot, that element of the force moving north from Malmedy was to relieve the paratroopers. It was anticipated that the

---

\* Editor's Note: Hohe Venn is sometimes called Plateau des Hautes Fanges. See note above, p. 65.

relief force would arrive approximately nine or ten hours after the initial landing. The 2d Group, 3d Air Transport Wing, under the command of Major Baumann, and an additional air transport group, organized on short notice and placed under the command of Captain Brambach, were the air transport units assigned to the operation. Major Baumann was appointed operation control officer.

#### B. Preparations for the Mission

On 11 December 1944, at a conference held at Headquarters, Air Command West, Colonel Wolf, Chief of Staff, briefed the paratrooper and air transport commanders on the impending mission. Special permission had to be obtained before the units' staffs and subordinate commanders could be informed of the contemplated action. For reasons of security, the initial planning and preliminary preparations were to be carried out only by the two commanders concerned (i. e. of the paratrooper force and of the air transport force).

From the very beginning it was obvious to all concerned that because of the enemy's overwhelming air superiority the operation could only be carried out under cover of darkness. Moreover, the operation had to be timed to coincide with the beginning of the offensive, and the aircraft would have to keep out of enemy radar range as long as possible. This meant that the approach flight would be accomplished at low altitude in order to utilize the protection offered by the mountains as long as possible and to exploit the advantages of the approach route. For this reason, it was suggested that the transport aircraft take off from the airfields at Paderborn and Lippspringe, fly on to Bonn - Hangelar, and then pick up the direct course to the landing area. As long as they were flying over German territory there would be no difficulty in picking up individual control points as navigational aids. Once they had crossed the front, however, clearly defined signals would have to be developed, for the last five and one-half miles would have to be flown by time computation only. Visual landmarks would be of minor significance during the entire approach flight.

As far as flight formation was concerned, the operation leader was pretty much limited to single-file flight by the average ability of his charges, none of whom had had any experience in night formation flying. For a total of seventy aircraft, this would have meant forty minutes of flight time from the take-off base to the landing area. The paratroopers, on the other hand, could hardly be expected to accept

this, since dragging out the action to such an extent would certainly have robbed it of most of its effectiveness. The utmost that their commander could possibly demand from the aircraft crews, however, was to fly in groups of three (provided there was moonlight) and to reach the landing area in time to drop the paratroopers at dawn. On the other hand, an incident which had occurred at the Parachute School at Gardelegen counseled against this method. There, a practice landing at night, with the aircraft approaching the target area in groups of three, had resulted in catastrophe. The paratroopers jumping from the lead aircraft had collided with the second plane, which was flying somewhat lower than the lead airplane in order to be able to distinguish it clearly against the horizon. No matter how important a mission might be, there could be no justification for risking men and equipment in a method which had already proved dangerous. Finally, the paratrooper commander was prevailed upon to agree to single-file flight, provided that the landing operation could be reduced to an acceptably short period.

During a second conference at Headquarters, Air Command West, on 14 December 1944, Generalmajor Dietrich Pelz, Commanding General of the 2d Fighter Corps and an officer of long experience and a high degree of ability, was able to suggest a solution which was both feasible and satisfactory. His recommendation that the approach flight be carried out in bomber-stream formation was discussed and accepted. Under this plan, the transport aircraft would take off singly but with an interval of only thirty seconds between take-offs. This interval would be carefully maintained throughout the entire approach flight so that an aircraft would appear over the target area every fifteen seconds (since the aircraft would be taking off from two different airfields simultaneously). In this way the landing could be accomplished in approximately seventeen minutes. In view of the vital importance of the operation the air transport commander declared himself willing to accept this solution, despite the fact that his units had had no experience whatsoever in take-off or flight operations of the type suggested.

Both air transport groups were temporarily assigned to the 2d Fighter Corps, which was to provide any necessary advice and assistance in preparing for the operation. Since the Corps staff had had a great deal of experience in air operations on the Western front and was eager to do everything in its power to help, this temporary association was a decisive factor in the ultimate success of the action.

The Corps assumed responsibility for setting up a beacon-lighted route for the approach flight. Bonn was clearly marked by a searchlight dome (provided by four searchlights) and by star shells fired by the antiaircraft artillery. An antiaircraft artillery piece, which was to fire varicolored star shells at predetermined intervals, was set up at the front crossing-point. This proved to be an excellent navigational aid, and with its help there was little chance that any of the aircraft would fail to find the target area. In order to eliminate all uncertainty between the front and the target area, however, a pathfinder group was to lay a pattern of incendiary bombs right next to the landing area as soon as the first transport aircraft appeared over the target; this pattern would burn brightly for some twenty minutes and would enable the transport aircraft to pick out the target area from considerable distance. In addition, tracer shells would be dropped over the area periodically. (It was also planned to drop dummy paratroopers from He-111's in order to confuse any enemy troops which might happen to be in or near the real landing area.) In addition to all these landmarks and other navigational aids, the corps prepared detailed airway charts which were to be given to the transport crews in time for them to be studied before the take-off. At this point, since the preparations were assuming rather vast proportions, permission was granted to inform the adjutants and navigation officers of the coming operation.

Inasmuch as the time selected for the launching of the offensive was dependent upon the weather--and, in fact, upon a period of inclement weather--, the planners knew in advance that the approach route would be characterized by poor visibility and low-lying clouds. Weather conditions over German territory, of course, could be ascertained at any time without difficulty, but as an additional precaution it was planned to send a weather reconnaissance aircraft along the approach route immediately before the take-off in order to obtain last-minute reports.

After every imaginable precaution had been taken to make the flight itself as foolproof as possible, there still remained a rather special problem to be solved in connection with the take-off. If the aircraft taking off from Bad Lippspringe were to proceed to the Bonn airfield by direct course, it would be necessary for them to fly over the Paderborn airfield shortly after taking off, and this might mean a disruption of the take-off action from the latter field. In order to avoid this difficulty it was decided that aircraft at both fields would take off in an east-west direction only. After attaining flying speed, each

aircraft was to proceed straight ahead for exactly two minutes, to climb at the rate of 3.28 feet per second, and to bank in a blind turn over the first orientation point, Wewelsburg, which would be marked by two searchlights. From Wewelsburg on, the aircraft belonging to the 2d Group, 3d Air Transport Wing (under Major Baumann) were to fly south of the beacon-marked route, and those belonging to the other group (under Captain Brambach), north of it. In order to avoid difficulty and delay in the take-off action, the aircraft were to line up closely behind one another along the length of the field. Each aircraft was to move up to the take-off point as soon as the aircraft immediately in front began to move.

Since the danger of enemy air attack was ever-present, air-field illumination had to be kept to a minimum. A total of five searchlights were to be used to illuminate the flare paths, and a man was posted at each one of them with orders to black it out upon receipt of a prearranged signal. In order to lessen the danger of a mid-air collision, the tail gunners were provided with flashlights with which to indicate their positions (by blinking the flashlights) or to warn of danger ahead (by showing a steady red beam). The weakness of these light signals meant that they would not really increase the danger of attack by our own night fighters; since only about a third of the air transport craft were equipped with flame dampers the remaining two-thirds would be clearly visible at night because of their exhaust flames, which were some six and one-half feet long. Under these circumstances the only really adequate protection would have been a strong fighter escort.

The 2d Group, 3d Air Transport Wing, under Major Baumann, had thirty-two Ju-52's; the Air Transport Group Brambach had thirty-five Ju-52's; and Assault Group von der Heydte, consisted of an operations staff and five companies. Together, these units constituted the assault force.

Each aircraft was to transport thirteen or fourteen paratroopers and four weapons containers; the paratroopers and their containers were distributed by units among the squadrons. The weapons consisted primarily of machine guns, submachine guns, assault guns, antitank guns, and a good supply of explosives.

The transport aircraft were fully equipped for a paratroop mission. They had a newly developed release mechanism for the dropping of the weapons containers; most of them were equipped with



a radio set and with a machine gun in the tail. As might be expected, in view of the period at which the action took place, the condition of the aircraft themselves was fairly poor. Many of them had not been completely (or even partially) overhauled for a long time and both motors and fuselages showed evidence of wear and tear. Taking this factor into consideration, the speed for the approach flight was limited to between 105 and 112 miles per hour.

On the whole, the level of competence of the crews belonging to the 2d Group, 3d Air Transport Wing, was good. As a special duty unit assigned to the Luftwaffe High Command it had been in action fairly continuously and during the preceding summer it had had opportunity to work with the paratroopers in several practice exercises. The training standard of the Brambach group was considerably poorer. Its crews had been away from the front, in Germany, for over a year and during that time the gasoline shortage had made it impossible for them to fly more than a very few missions. They had completed the required training in instrument flight but had had very little actual experience. Hardly a one of them had ever taken part in a night mission over enemy territory.

By command of higher headquarters, a number of parachute observers were assigned to the mission shortly before it was scheduled to start; these men were to supervise the conduct of the landing. They were, to be sure, highly capable officers from the parachute forces but they had seen no action since the undertaking in Crete and not one of them had ever participated in a night mission. In order to make room for them, the mechanics, who normally shared the cockpit with the pilots in order to assist them in whatever way they could, had to move to the rear of the aircraft and the pilots had to do without their often valuable help during the flight.

Coordination between the air transport and paratrooper units was good. There had been several practice runs of the loading operation, so that the aircraft crews and the paratroopers knew exactly what to expect. On the day of the mission the loading was accomplished without difficulty. Unfortunately, in an attempt to descend upon the enemy with the greatest possible strength, the paratroopers added so much weight in the form of extra weapons and ammunition that the loading capacity of the aircraft (two tons) was exceeded without the knowledge of the crews. As a result, some aircraft experienced difficulty in taking off, and in one case an aircraft actually crashed--

fortunately without any loss of personnel. Moreover, the heavier load proved to be a disadvantage in maintaining the predetermined speed during the approach flight.

As for the technical facilities and ground organization services, the take-off bases were well-equipped and proved totally adequate.

### C. Performance of the Mission

The air transport units were alerted to readiness on 7 December, and on 8 and 9 December they moved, by squadron, to the airfields Paderborn, Bad Lippspringe, Senne I, and Senne II. The move took place under cover of darkness, and the aircraft were camouflaged as soon as they reached their appointed airfields so that there might be nothing to indicate to the enemy--who regularly flew over these fields several times a day--that an action was in preparation. The aircraft crews were billeted in nearby communities. The two advance airfields near Senne were not fully equipped, and served as parking areas only. In fact, they were rather difficult to locate; Senne II could be found only by sending up a special reconnaissance aircraft to look for it--it lay in a clearing in the woods inside a maneuver area, and the local authorities had never heard of it.

During the entire alert period all telephone communication in connection with the operation was stopped; contact between the planning staffs and the units was maintained exclusively by courier. It was not until 10 December that the air transport and paratrooper units were permitted to establish contact with one another. In order to maintain absolute secrecy, \* preparations were carried out by the smallest possible number of men; the mission was to be kept secret from the aircrews themselves until just before the take-off when they would be oriented in a regulation flight briefing.

The evening of 16 December was set for the start of the

---

\* Editor's Note: According to John Toland, shortly before the operation was to begin an Allied agent in Germany got off a radio message to Allied Intelligence stating that 15 Ju-88's and 90 Ju-52's would take off at 0145 from the Paderborn-Wahn area for a destination ten miles south of Aachen. See John Toland, Battle, the Story of the Bulge, Random House, (New York, 1959), p. 43.

operation. This deadline could not be met, however, because the paratrooper units had not all arrived at the take-off bases in time. For their trip to the bases many of them were dependent upon transport columns from other areas, and some of these had encountered difficulty in locating the paratrooper billets to pick up their charges and in finding the way to the airfields. In this respect, the need for absolute secrecy had been somewhat exaggerated. At this point, of course, a veritable epidemic of telephoning broke out, which might well have destroyed every advantage gained by the careful adherence to security regulations. Timely enemy bombardment of the airfields at Paderborn and Bad Lippspringe would have spoiled everything. Nervousness was fairly widespread. The beginning of the operation was postponed to 17 December.

All the unit commanders, pilots, parachute observers, and radiomen were assembled at the airfield at Bad Lippspringe for a situation conference and flight briefing. The mission was announced and detailed explanations were given regarding the way in which it was to be accomplished. Take-off, approach flight, and the landing of the paratroopers were discussed and explained in detail. Each crew was issued a terrain map and a route chart on which the light beacons were clearly marked. An attempt was made to impress each participant with the importance of maintaining exact flight discipline and of adhering to the predetermined course and times--not only the success of the undertaking but also his own chances of survival might well depend upon it.

The following weather report was received:

Approach route hazy, with visibility poor; cloud cover nearly 10/10; mountains hidden by clouds in some areas; target area: 10/10 cover down to about 650 feet above ground level; wind from west-southwest at eighteen and one-half miles per hour.

In order to obviate later difficulties, each crew was required to compute course, flight time, and control times under the watchful supervision of the squadron captains. A night-fighter pilot returning from the target area confirmed the weather report but added that it seemed to be clearing up over the target itself. He estimated the wind velocity as greater than stated in the original report and this was then substantiated by the local weather observation station. All computations

had to be done over again, based on a wind velocity of twenty-eight to thirty-one miles per hour.

In order to keep out of the range of enemy radar equipment and to avoid enemy night-fighter patrols, which, as experience had shown, operated between 500 and 650 feet, the transport aircraft were ordered to maintain a maximum flight altitude of just under 500 feet. After the first control point, Wewelsburg, the terrain rose gradually to a height of about 1,280 feet at the second control point, Ruethen. The same was true of the next stretch, as far as the Kahlenberg Hills, which reached a height of some 1,935 feet. From this point on, the terrain remained fairly level to the Ebbe mountains. Searchlight-marked control points were located just before the Lenne mountains, in the Ruhr Valley, and south of Plettenberg. Between Plettenberg and Bonn the terrain gradually grew flatter. The aircraft were to fly over the Bonn-Hangelar airfield, which would be easy to identify by the searchlights and by the flare shells sent up by the antiaircraft artillery just north of the city. From Bonn on they were to fly on direct course to the landing area just west of the highway between Eupen and Malmedy. This last portion of the route was marked at two points, at one with a special beacon, flashing on and off in a prearranged signal, and at the other (just north of Euskehl\*) with varicolored flare shells fired by the antiaircraft artillery. This latter was the border crossing point. The last few miles, over enemy territory, were extremely difficult to negotiate. While the aircraft were to keep as low as possible in order to prevent at least the medium and heavy artillery from aiming effectively, the steep rise in the terrain beyond Monschau caused treacherous down drafts along the slopes thus making it imperative that the aircraft maintain a certain safety altitude. Moreover, since the aircraft had to be at least 400 feet above ground level when the paratroopers made their leap, † a certain amount of superelevation would be inevitable after this point.

After dropping the paratroopers the aircraft were to veer to the north to get on their return route because there was a large troop exercise area just south of the target and it was assumed that antiaircraft fire would be more intense there. On the return flight the

---

\* Editor's Note: This name does not appear in any of the standard gazetteers.

† The landing area itself was approximately 985 feet square.

aircraft were to fly at low altitude, following the same route they had used for the approach. Since there had been a light snowfall, orientation by ground landmarks would be possible for at least a part of the way.

Examination of the mission report reveals that both transport groups took off on schedule. One aircraft belonging to the 2d Group, 3d Air Transport Wing, had crashed immediately after take-off due to overloading, but no lives were lost. Not all of the aircraft had been able to maintain the established flight speed, and as a result some of them failed to reach the target area until after the incendiary bomb pattern had already burned out. Under these circumstances it was unrealistic to expect exemplary accomplishment of the paratrooper drop. Paratroopers had jumped from one aircraft over the Bonn-Hangelar airfield, because the parachute observer, in the erroneous assumption that the lights below were the prearranged illumination of the target area, had given the jump signal without consulting the group commander first. Still another parachute observer, misled by visible ground activity and by searchlights below, gave his signal immediately after the aircraft had crossed the front. Eight aircraft belonging to Brambach's group lost their way and ran into heavy enemy fire over the Aachen - Dueren area; some of the paratroopers were able to leap to safety.

It was a definite disadvantage that the majority of the air crews employed in this very difficult mission were so young and had had so little experience. They had become confused by the absence of searchlights at one point along the way, had mistaken the flash of antiaircraft artillery fire over Cologne (which happened to be under heavy enemy bombardment at the time of the mission) for the planned signal fire at Bonn, and--in complete defiance of their computed course--used Cologne as the control point for setting their course to the target area. This, of course, brought them into the Aachen area.

The landings of the returning aircraft went off smoothly and without any enemy interference. Two aircraft had been shot down by enemy night fighters over German territory, and enemy scout aircraft were spotted in the vicinity of the fields. Because of this, both transport units moved to the Senne airfields right after dawn. The move proved to be extremely fortunate, despite the fact that it had to be carried out in the worst possible weather, for shortly thereafter both Paderborn and Bad Lippspringe were attacked by enemy bombers.

About a week after the mission, two paratroopers from von der Heydte's group, who had managed to make their way back to their own lines, reported on the action at the landing area. According to their reports, more than one hundred seriously wounded paratroopers were picked up by the Americans. Their injuries were all incurred as a result of the leap itself. The actual wind velocity over the target was approximately thirty-seven miles per hour, whereas the maximum velocity consistent with a safe landing is about eighteen and one-half miles per hour. Thus, many of the paratroopers came down at some distance from the appointed landing area. Discounting those paratroopers who were dropped elsewhere and those carried in the aircraft caught by enemy fire, the total paratrooper strength for the action was 450 instead of the 870 originally planned. Although the action was scheduled to last only about ten hours, in reality the force succeeded in blocking the highway for nearly three days. When it became apparent that there was no chance of making contact with the ground force, because the entire offensive was not running according to plan, von der Heydte gave orders that the paratroopers were to try to make their way eastwards to their own lines, either singly or in small groups. He himself had been seriously injured during the leap and had caught pneumonia besides. Thus, incapable of moving or even of being transported, he was forced to give himself up to the Americans, who interned him in the forest ranger's quarters at Monschau as a prisoner of war.

#### D. Conclusion

The success of the paratrooper landing--and in all fairness to both the paratroopers and the air transport units it must be reckoned a success, despite the many mishaps attending its accomplishment--had no real effect on the course of the offensive. Indeed, it could have none, because the entire Ardennes offensive came to a complete halt after a very short time and there was no alternative but to write it off as a failure. Neither the strength nor the organization of the available forces was sufficient to sustain the assault for any length of time and to turn the tide of battle against the enemy, despite individual instances of success at the beginning.

Even so, this last instance of combat employment for the air transport units, in conjunction with the parachute forces, must remain an important operation in respect to situation, planning, and accomplishment. Despite its fairly limited scope, it provided a

completely new field of endeavor for such actions, as well as a very valuable body of experience for future reference. The fact that it was carried out at night was a complete innovation for the German Air Force,\* and regardless of whether one considered the navigational aids too primitive or too exaggerated they pointed the way to a field definitely worthy of further development; a few months later, of course, any possibility of such development came to an end.

Section II: Air-Supply Operations on the Atlantic Front, June 1944-  
May 1945<sup>2</sup>

A. Plans and Preparations

In the spring of 1944, the Allied air forces intensified their systematic attacks on targets in western France and western Germany, penetrating far into the eastern theater of operations. This strongly implied that the Allied invasion, long expected, would be forthcoming in the near future.

In cooperation with appropriate Army agencies, the Third Air Fleet arranged to have a Luftwaffe officer, experienced in air transport, take charge of reconnoitering for suitable landing and supply-drop areas in western France.<sup>3</sup> The areas selected on the basis of reconnaissance reports were carefully defined, given military designations, and sketched in on detailed maps. The Headquarters, Third Air Fleet, called for suggestions regarding the minimum preparations which would have to be made to make the areas adequately useful. In cooperation with the Air Fleet, the Army supply agencies concerned took the necessary action to procure and transport supplies and drop

---

\* Editor's Note: In HUSKY No. 1 (9 July 1943), an American paratroop operation during the conquest of Sicily, 2,781 paratroopers of the U. S. 82d Airborne Division were dropped in almost complete darkness. FUSTIAN (a British operation), GIANT I (Revised), GIANT III and GIANT IV offer additional examples of early Allied night paratroop drops. See Craven and Cate (eds.), The Army Air Forces in World War II, Vol. II, Europe, TORCH to POINTBLANK, University of Chicago Press (Chicago, 1949), pp. 449, 454, 531, 533.

containers to the areas where they would presumably be needed.

When the Allied invasion began, the Third Air Fleet had only one air transport group at its disposal. Moreover, as luck would have it, at the very moment it was needed this group was in process of being converted to the French aircraft model Leo-451\* at Le Bourget airfield. The group was by no means capable of employment. The Air Fleet immediately submitted an urgent request to the Quartermaster General, Luftwaffe High Command, for an additional air transport group, which was then employed in supply-drop operations. Because the Allied forces enjoyed absolute air supremacy over France, this unit had to be fully prepared for night missions. The 30th Air Transport Group was assigned to the Third Air Fleet. This group, which by training, experience, and equipment was ideally suited for the mission, had the newest models of the He-111. During the evening of 8 June 1944, the group moved to the airfields at Metz, Diedenhofen, and Trier. On 9 June 1944, the commanding officer of the group was given an orientation by the Quartermaster, Third Air Fleet.

In the beginning, no regular, clearly-defined air-supply missions would be carried out. The general orders merely specified that urgently needed supplies, particularly ammunition, would be dropped by the transport aircraft at especially important points along the invasion front. Just when this would be done, and just which target bases would be utilized, were factors which could not be predicted in advance. Although it was known that the supply situation differed greatly from sector to sector, there was no definite information available regarding the situation at the various individual sectors along the front. So far, all that was known was that: 1) there would be no chance whatsoever of landing troops in the operational area; 2) most probably, it would not be possible in the beginning for aircraft to land at any of the target bases; and 3) since there were no fighter aircraft available for escort duty all of the supply missions would have to be carried out at night.

The Quartermaster Branch of the Air Fleet was charged with

---

\* The Leo-451 was a twin-engine bomber which had been converted to use as a transport aircraft, although it was not at all suitable for transport operations. Later on, the group was reconverted to Ju-52's.



the responsibility of examining the air-supply requests submitted by the Army, Navy, and Luftwaffe in order to determine their relative urgency, and the employment of air transport forces was to be authorized only for the most urgent requests. So long as surface supply channels could still be utilized, air transport space was to be authorized very sparingly. The shortage in aviation fuels and the inadequacy of the available air transport space were ample justification for this measure. For the first time during the war, measures were taken to assure objective evaluation of the need for air-supply services and to put a stop, to some extent at least, to the indiscriminate employment of air transport space. Air transport leaders had been trying since 1941 to introduce a measure of this kind.

Supplies and supply containers were stored in the Paris area, and an airfield in the Paris area which was equipped to handle night activity was to be used as a take-off base.

#### B. The Chain of Command and the Participating Units

The 30th Air Transport Group was under the command of the Quartermaster, Third Air Fleet.\* An air force liaison officer, who also acted as operations officer, was assigned to the staff of the Quartermaster.

The majority of air-supply missions to the Atlantic front were flown by the 30th Air Transport Group.† Other air transport units were employed for the special missions which arose occasionally without prior planning.

The three squadrons of the 30th Air Transport Group had been refitted in Germany and were up to full aircraft strength (forty-two serviceable He-111's of the H-16 and H-20 types). The crews were fully qualified for instrument and night flying and the majority of them had had more than enough experience in operations, having handled air supply for the First Panzer Army and for the forces trapped on the Crimea. All of the aircraft were equipped with

---

\* Generalmajor Freiherr von Stein-Liebenstein zu Barchfeld was Quartermaster, Third Air Fleet, which was commanded by Generalfeldmarschall Hugo Sperrle.

† Commanded by Major Hornung.

intermediate racks, permitting a load of eight to nine supply containers per aircraft; each aircraft was capable of transporting a payload of from 1.6 to 1.9 tons of supplies.

Once the move had been completed--with one squadron each at the airfields Metz, Diedenhofen, and Trier--, immediate action had to be taken on 9 June to park and camouflage the aircraft. In view of the uninterrupted enemy fighter-bomber attacks, this was a first step of primary importance. These three airfields were only parking and dispersal areas; for the actual missions the aircraft were routed under cover of darkness to Orly airfield, outside of Paris, which served as the real take-off base. Every effort was made to avoid a large concentration of aircraft at any one place.

### C. Performance of the Missions

The Orly airfield had been well supplied by the responsible Army agencies and there were enough supply containers on hand for all the serviceable aircraft participating in the missions. The take-off strip had been heavily damaged by enemy bombardment, but was repaired in record time so that night supply missions could begin on 19 June 1944. Despite continuing attacks by enemy aircraft the technological facilities and services could be maintained without interruption. Returning from their missions the aircraft flew back to their assigned parking areas. The group operations staff, together with the technical personnel from the squadrons, was billeted at Orly airfield.

Cooperation between the Army supply agencies and the Luftwaffe was good. No plans had been made to transport troops to vital sectors along the Atlantic front, since there were no suitable landing fields for the He-111's. Thus, the preparations undertaken by the Army supply agencies were restricted to those necessary for air-drop operations. Indeed, because of the terrain and the military situation along the Atlantic front, supply by air drop was the only possibility for the moment. It was impossible to obtain even an approximate evaluation of the over-all situation and its potential further development, nor was there any information available regarding the volume and type of supplies required by the Army and Navy units. In order to be prepared for any eventuality, the air transport units made the necessary technical arrangements for delivery by air drop not only of supply containers but also of light-weight equipment fitted with freight

parachutes. These arrangements had to be coordinated carefully in advance with all the agencies concerned, the preparations being carried out under the supervision of the transport officer of each unit. The Army officers unfortunately had little or no familiarity with air-supply operations. They knew nothing whatsoever about such things as the packing of supply containers and weight distribution regulations. It was a serious mistake on the part of command that none of the Army officers who had worked closely with the air transport units in air-supply operations on the eastern front and had gained valuable experience in the requirements of such missions had been transferred to the west with the transport units. The Quartermaster, Third Air Fleet, suggested through the Quartermaster, Western Army, that a number of experienced officers be brought from the eastern front but his recommendation was disapproved.

Despite the lack of experience of the Army officers, they and the other personnel concerned worked with such energy and determination that the required supplies, properly packed in their drop containers, arrived at the take-off bases in time, and after the first night mission (19/20 June 1944) there was no difficulty in carrying out subsequent operations according to plan. The Army supply agencies, with the all-out support of the Luftwaffe units concerned, gradually developed the necessary routine in preparing for the air-supply flights, and the flying personnel from the transport units, whose help had been required in the beginning, were now freed for other duties. A reserve of ready-packed supply containers was established and stored in the Paris area. In order to obviate the necessity of unpacking these containers (holding ammunition, gasoline, foodstuffs, and medical supplies) and repacking them with other, unexpectedly required items later on, a supply of empty containers was held in reserve. This proved to be a wise measure, for as the airlift operation progressed there were frequent calls for the delivery of urgently-required items, the need for which had not been foreseen.

Night missions were rendered extremely difficult by the British and American night-fighter forces and the constant Allied bombardment of the take-off base at Orly.

The first mission, calling for the delivery of fifty tons of armor-piercing ammunition, was carried out by a force of thirty-five He-111's. The first aircraft took off at 2130, the rest following at three-minute intervals. The aircraft headed for the radio beacon at

St. Malo; passing St. Malo they descended to hedge-hopping altitude (which meant that they were flying lower than the coast itself along the rocky part of the shoreline) and continued around the Cap de la Hague, which permitted them to approach the well-marked supply-drop area just outside of Cherbourg from the sea. After releasing their supply containers at an altitude of 650 feet, the aircraft departed from the target at low altitude. Passing north of Paris, they returned to their assigned dispersal bases. One aircraft, straying too close to the island of Jersey, was shot down by German antiaircraft artillery (the batteries there had been given instructions to fire at any aircraft). During subsequent nights, the missions were carried out in the same general manner, except that approach and return routes were altered regularly.

The Quartermaster, Third Air Fleet, whose duty it was to assign priority to the various requests for air-supply services, did not always grant the demands submitted by the Army. Upon closer investigation it often turned out that air transport, while it might have been the easiest method, was by no means the only possible method of obtaining adequate supplies. Moreover, at this point there was no way to estimate the ultimate scope of air-supply operations and it was imperative that the small stock of supply containers be jealously guarded since each night mission carried out meant the irrevocable loss of 300 containers. The ammunition deliveries to the Cherbourg fort<sup>4</sup> continued until the night of 24/25 June.\*

The Cherbourg peninsula was the scene of stubborn fighting by a German assault group (under the command of Lt. Colonel Lindemann) defending itself against strong enemy attack. The encircled troops were urgently in need of food, particularly bread. Since bakery facilities

---

\* During the course of the fighting on the Cherbourg peninsula, the 30th Air Transport Group was utilized in air-supply missions to that area from 20 through 30 June. A total of 188 tons of supplies, including flour and arm-bands for Organisation Todt members (these were construction troops), were transported by the 107 aircraft which participated in the airlift. The losses sustained were higher during these ten days than the ones suffered previously by the Group while in combat. Personnel losses were as follows: 19 killed, 10 missing, and 6 wounded in action.

in the encircled area were still intact, it was decided to fly in supplies of flour. However, the flour had been packed in sacks, inside of old-fashioned wooden air-drop containers of 2,250-lb. capacity. Despite repeated warnings that the wooden containers, even if fitted with freight parachutes, would not be able to survive the landing impact (particularly if the parachutes failed to open completely, as was often the case), the Army supply agencies insisted that they be delivered by air drop. The results were exactly as had been predicted; the majority of the containers burst open upon hitting the ground, and after the mission was over the supply drop area had the appearance of a landscape buried under heavy snow. Fortunately, there was no rain during the night so that some of the flour could be salvaged and actually used for bread. This fiasco could have been avoided if the Army supply agencies had listened to Luftwaffe representatives and had followed the latter's recommendations that the flour be repacked in 560-lb. containers. Despite the urgency of the mission, the one extra day required to carry out the repacking operation would not have made any great difference. Somewhat later, when another load of 2,250-lb. containers of flour was brought to the take-off base for loading into the transport aircraft, the commanding officer of the unit refused to carry out the mission. His refusal had the full support of the Quartermaster, Third Air Fleet, who then made every effort to secure rapid action in having the flour repacked in 560-lb. containers.

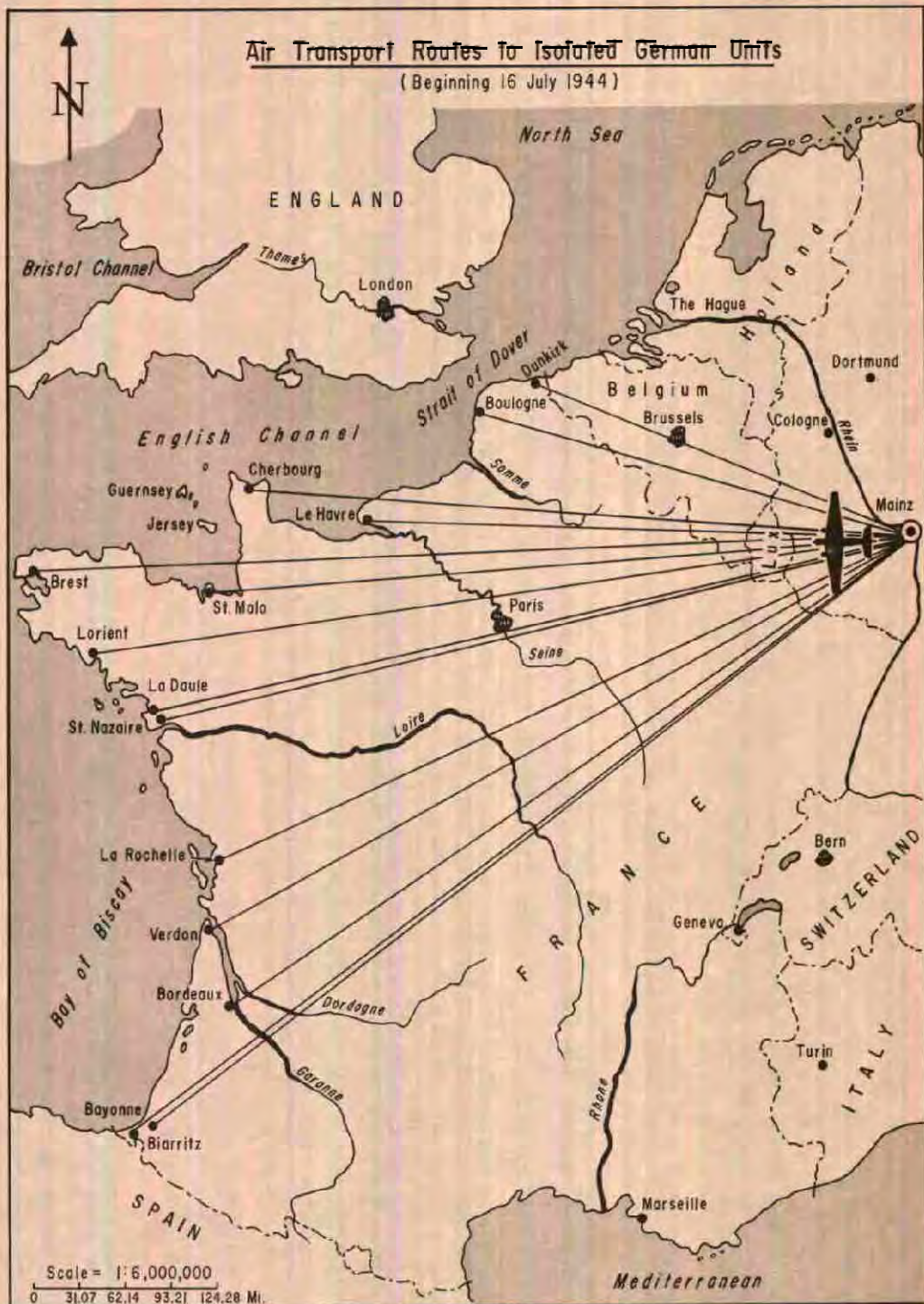
Until the end of June 1944 air-supply missions were restricted for the most part to small-scale operations for the benefit of isolated troop units in the Cherbourg area. The airfield at Orly remained in use as a take-off base until 17 August 1944. After German forces had departed from the Paris area, the 30th Air Transport Group was transferred first to Mainz and then, shortly thereafter, to Klein-Welzheim.

In the meantime, other German units had been cut off from their supply sources, and air transport operations now began to supply forces at Le Havre, St. Malo, Brest, Lorient, La Daule, St. Nazaire, La Rochelle, the mouth of the Gironde River, and Bordeaux.

With the transfer of the 30th Air Transport Group to take-off bases near the western border of Germany, the approach routes used by the aircraft were lengthened until they comprised almost their total range of action.\* Refueling stops in the target areas, most of

---

\* For the routes used, see map on the following page.



which boasted nothing more than improvised landing fields, were out of the question. Landings within the target area had to be made on occasion, whenever the transport cargo consisted of items which could not be delivered by air drop, as, for example, dismantled submarine crankshafts.

Enemy bombardment of the take-off bases and constant harassment by enemy night-fighter aircraft made preparations for the supply missions extremely difficult. Enemy night-fighter activity was also a tremendous strain on the air transport crews, who were already subject to the exertion inherent in flying long distances at night. Losses were extremely high. By the end of the year there were very few of the original crews still intact; most of them had been shot down and were either dead, missing in action, or prisoners of war. The procurement of replacement aircraft did not always keep pace with the number of aircraft destroyed. By the end of 1944, the 30th Air Transport Group had only twelve to fifteen serviceable aircraft left. Emergency landing fields had been improvised at several points within the target area in order to permit the landing of vitally important spare parts and other supply items. In order to maintain morale by giving the encircled troops some tangible evidence of their connection with home, the transport aircraft also carried mail.

There are no figures available regarding the volume of supplies delivered by air transport. We can assume with absolute certainty, however, that fifty tons of supplies per night were transported during the period from June through August 1944. After August, when supply missions to individual resistance points began, this figure sank to less than twenty tons per night.\*

Smoothly functioning air traffic control and communications facilities were an important prerequisite to the success of the air-supply operations. As long as the missions were being carried out from the Paris area there were sufficient radio and direction finding stations available; telephone and teletype channels were also still in working order. After the transport units had moved into the Mainz area, however, --and later to Klein-Welzheim, east of the Main River-- the major portions of the approach and return flight routes lay over enemy-occupied territory. The navigational problems of these later

---

\* See note above, p. 297.

missions had to be worked out ahead of time with great care. Upon leaving friendly territory, the last available navigational aids were located on the east bank of the Rhine River, and no more were available for use until the aircraft were already in the vicinity of the target area. There were almost no intermediate facilities along the long flight route for checking position.

During the first two months, weather conditions were nearly always good and there was no real need for forecasts and predictions. The relative brightness of the few night hours was a decided disadvantage for successful accomplishment of the missions. Wind direction and velocity data, which were extremely important in planning the supply flights, were furnished by the weather observation stations in the Paris area. During the winter there were no weather reports available from the intervening territory occupied by the enemy. The target areas submitted regular radio reports, but these were necessarily limited to local conditions (general weather situation, visibility and cloud cover, for example). The approach to the target areas had to be carried out under conditions of good visibility. A landing at any one of the improvised fields was possible if the field was well-illuminated by bonfires; even then, it was a risky undertaking. In order to avoid enemy night-fighter aircraft, the transports utilized instrument flight techniques and stayed inside the clouds during their approach and return flights.

The personnel, equipment, and facilities available for technological maintenance of the transport units were adequate. The three dispersal fields and the take-off base at Orly, as well as the fields in Germany, had the necessary technical equipment to handle the maintenance and repair of aircraft. Available supplies of spare parts were adequate at all times.

The reporting duties of the air transport units consisted in the transmittal of operational reports to the Quartermaster, Third Air Fleet. The Quartermaster then took care of forwarding these reports to higher headquarters, thus relieving the units of the necessity of doing so. This greatly facilitated the preparations for the missions and also their accomplishment. Cooperation with the Quartermaster, Third Air Fleet, was excellent.

Within the framework of preparations for the defense of the Atlantic coast, which had begun immediately after the close of the



## Table

## GERMAN AIR TRANSPORT STATISTICS FOR WORLD WAR II

## Aircraft dispatched:

1 Sep 1939 - 15 May 1943	218,019
15 May 1943 - 5 Aug 1945	<u>85,755</u>
	303,774

## Troops flown to the front:

1 Sep 1939 - 15 May 1943	853,291
15 May 1943 - 5 Aug 1945	<u>346,000</u>
	1,199,291

## Supplies flown to the front:

1 Sep 1939 - 15 May 1943	245,350 tons
15 May 1943 - 5 Aug 1945	<u>640,912 tons</u>
	886,262 tons

## POL flown to the front:

1 Sep 1939 - 15 May 1943	1,369,320 gals.
15 May 1943 - 5 Aug 1945	<u>541,000 gals.</u>
	1,910,320 gals.

## Wounded evacuated by air:

1 Sep 1939 - 15 May 1943	475,503
15 May 1943 - 5 Aug 1945	<u>188,550</u>
	664,053

## Troops evacuated by air:

1 Sep 1939 - 15 May 1943	242,599
15 May 1943 - 5 Aug 1945	<u>98,000</u>
	340,599

## Materiel evacuated from the front:

1 Sep 1939 - 15 May 1943	28,826 tons
15 May 1943 - 5 Aug 1945	<u>11,000 tons</u>
	39,826 tons

Aviation gasoline consumed:

1 Sep 1939 - 15 May 1943	451,252 tons
15 May 1943 - 5 Aug 1945	<u>185,125 tons</u>
	636,377 tons

Miles flown:

1 Sep 1939 - 15 May 1943	119,702,097 miles
15 May 1943 - 5 Aug 1945	<u>47,428,875 miles</u>
	167,130,972 miles

301-A

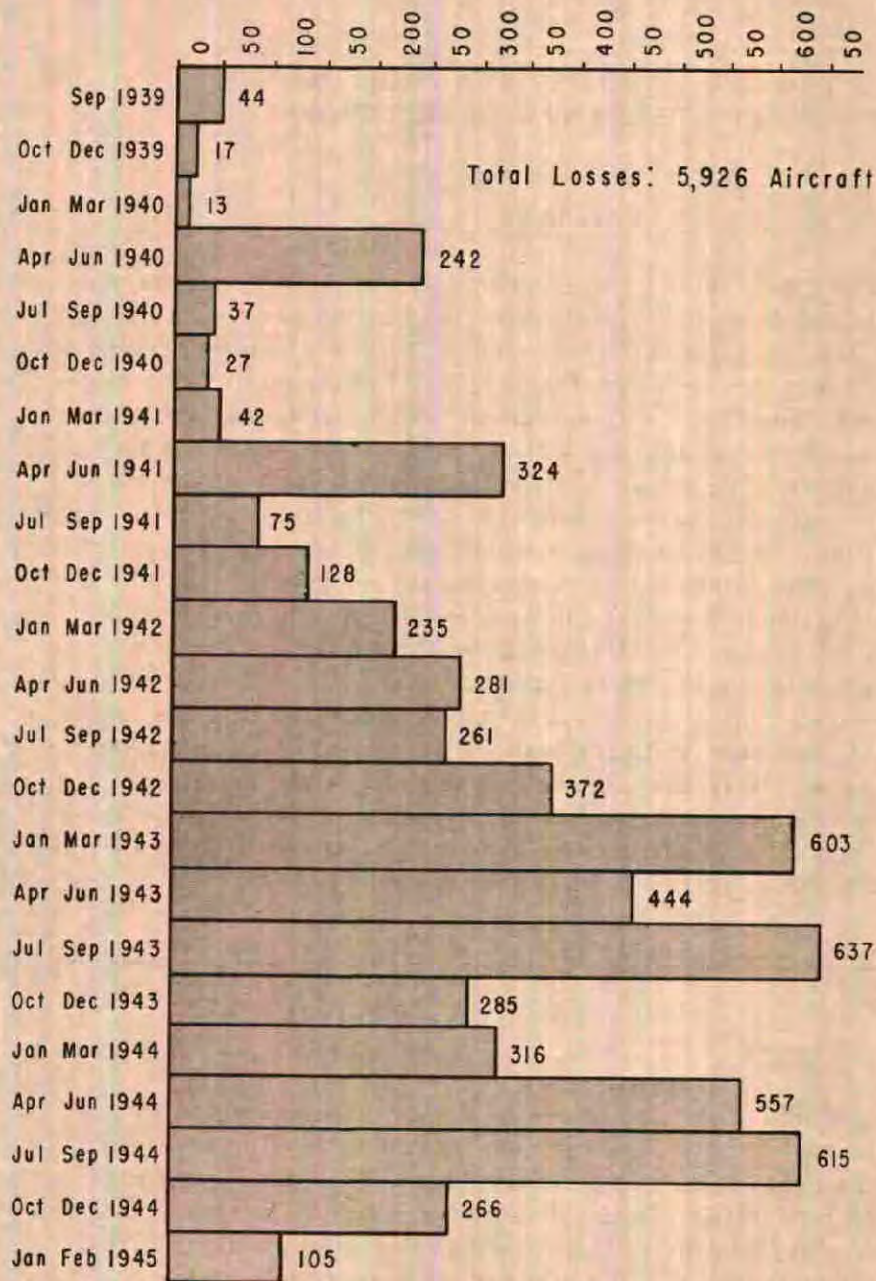
Western campaign in 1940, certain bases had been designated as vitally important. These bases were to be held even if the enemy should encircle them, as was anticipated. They were to be provided with supply stores in accordance with the nature and priority of the part they were to play in the over-all action. Just why this was not done, i. e., why supply stores--at least enough to last for a short while--were not established in advance at these important points is certainly a justifiable question; but it is not within the purview of this study to investigate the matter further. Air-supply operations to these bases, however, were seriously hampered by the inadequacy of the preparations made by Army supply agencies. The usual procedure was this: as soon as a request for air-supply services was received, the Army supply agencies began certain preliminary preparations. Not until the Luftwaffe entered the picture, however, was work begun to create the conditions prerequisite to a successful airlift action. On the whole, Army agencies were unfamiliar with the experience gained during the many airlift operations carried out on the Eastern front and thus they were obviously not in a position to profit by this experience. Not only were experienced officers from the Eastern front sadly lacking, but also no attempt was made to transfer any of them to the West. The encircled forces, however, did everything in their power to facilitate the accomplishment of the missions.

In terms of the volume of supplies delivered, the missions carried out during these last months of the war were of very small scope. They did, however, help to avoid a number of supply bottlenecks, particularly for the submarine bases on the Atlantic coast. For weeks and even months on end they provided valuable moral support for the encircled troops, and from this point of view they were a significant factor in the maintenance of fighting morale.

In conclusion, the reader is referred to the table on the preceding page and the graph on the page which follows. They provide a statistical summary of the accomplishments of the air transport forces and of the tremendously high losses sustained by them. Perhaps these figures best illustrate the courage, devotion to duty and sacrifices of Germany's air transport crews in World War II.

301-B

German Transport Aircraft Losses \*



\* From the records of Branch 6, Luftwaffe General Staff  
Karlsruhe Document Collection,

## Chapter 6

THE LESSONS TO BE DERIVED FROM GAF AIR  
TRANSPORT OPERATIONS IN WORLD WAR IIIntroduction

In this chapter, we will attempt to summarize the lessons of experienced gained from the actions described in the preceding chapters in order to point out and evaluate those factors which were particularly significant for each undertaking--in either a positive or negative sense--and, thus, for the development of the air transport forces as a whole. At the same time we will try to illustrate the most important conclusions to be drawn from retrospective study of the individual undertakings, conclusions which--appropriately adapted to specific conditions--must find application to the structure of any air transport arm in the future. In a very real sense, they outline a possible organizational form for the future. For, without any doubt whatsoever, the employment of aircraft as a means of transport--treated during the last war with the suspicion and hesitation usually reserved for untried innovations--must be incorporated into the thinking and planning of future military leaders as a clearly defined factor. The chief purpose of this chapter is, therefore, to provide an understanding of the basic concepts and ideas involved, to evaluate their significance, and to offer them in the form of principles of commitment as a guide for a future air transport organization.

Section I: Principles Applicable to the Commitment of Air Transport ForcesA. General

During World War I the intensive surge of development in the field of aviation opened up the skies as a potential scene of military operations. To begin with, the primary advantage in the use of aircraft lay in the possibility of extending reconnaissance activity, previously earthbound, into the area far beyond the enemy's front. The next step, the development of the aircraft as a weapons carrier, came about automatically in the attempt to prevent the enemy from carrying out aerial reconnaissance over one's own operational area. The conflict of armed enemy aircraft in the air led to combat actions

which were almost entirely independent of what was happening on the ground. The classical aerial conflict, fighter against fighter, soon came to represent the struggle for mastery of the skies over the front lines. The goal of the struggle was absolute air supremacy which would permit the side possessing it to carry on a variety of military actions without interference, for in the meantime the possibility of employing aircraft as bomb carriers had been recognized and developed, and aircraft were soon being committed as an extension of the artillery forces.

Thus, the limitations of artillery range were extended, the attack of important military targets far behind the enemy lines made possible, and bombers took their place as important instruments of warfare beside the reconnaissance and fighter aircraft. At that time the results they achieved were a far cry from the complete devastation of a quarter of a century later, a degree of devastation which made aerial bombardment one of the chief horrors of World War II, not only for the fighting troops but for the people at home as well.

During World War I aviation had not yet reached that stage of development at which consideration could be given to the possibility of utilizing the skies to meet certain requirements of military transport. As a result, air transport had no place in the new service.

By the time World War I had come to an end, the concepts of aircraft employment in terms of reconnaissance, fighter, and bomber aircraft had become well established. The experience gained by Germany during the war and the data collected through the study of foreign air forces were carefully evaluated and were put to good use when the German Air Force came into being as an independent branch of the armed forces. Both organization and chain of command were largely based upon this body of experience.

It was not until the period between the two wars, however, that the possibility of military air transport was even taken into consideration, and that was a result of the tremendous expansion in commercial freight and passenger flight. From today's vantage point it seems incredible that Germany's military leaders paid scant attention to these developments in commercial aviation.

Under the circumstances, then, it was not until World War II that the tremendous versatility inherent in the utilization of aircraft

in the transport missions faced by a modern military force could be demonstrated. And even then, such utilization was not due to planned development; there was no body of experience to fall back on and no doctrine to refer to for potentialities and limitations. Even in those instances characterized by a certain amount of planning and preparation, the aircraft was viewed as nothing more than a highly specialized means of transport required for the furthering of parachute and air-landing forces. This thinking was a fundamental and serious error, for technological developments soon far outdistanced the restrictions imposed by this single method of utilization. Limitations on performance were considerably reduced and, at the same time, there was a wide-reaching shift in the significance of various areas of endeavor. Even though this trend might not have been so apparent in the military field and its effects not subject to accurate evaluation, it certainly should never have been so completely ignored, especially during its later, unmistakable stages. At that point every effort ought to have been made to catch up with what had been missed. Certainly, the most cursory glance at the enormous upsurge in commercial aviation should have been enough to point the way.

A critical examination of the situation, however, should not lose sight of the fact that any weapon system, regardless of the thought and care which have been devoted to its development, is faced with certain factors which cannot be foreseen and cannot be compensated for ahead of time. Above all, there is the transition from rational planning for developmental improvement to the exigencies of actual employment, which make further development mandatory and which play a large role in determining the directions followed by such development. There are two possibilities: either the method of employment must be based on the capabilities and limitations of the weapon system concerned, or the exigencies of employment must determine the capabilities to be developed in the weapon system. If the latter is the case, it may even be possible that radical changes in design are desirable or imperative; it is clear that such changes can be accomplished only gradually and that new developmental directions must be based upon that which is already available. The maintenance of continuity is vitally necessary to the equilibrium of an over-all military effort. On the other hand, this should not be interpreted as the determination to retain at any price what is already available, while relegating desirable alterations to the limbo of futile improvisation and to an uneven struggle for acceptance.

Unfortunately, this was exactly what happened in the case of

the development of the German air transport forces. The airlift undertakings themselves offer ample proof, if one takes the trouble to go through the reports with a view to extracting a series of principles to guide the commitment of air transport units.

In the interests of clarity and logic, we have classified these principles of commitment in accordance with certain definite criteria which bring out their relative validity and importance.

### B. Employment Principles

All those concepts and guidelines which refer to the accomplishment of a mission, to a chain of command, or to preparatory measures taken under highly specialized conditions are classified as employment principles of secondary importance. It is clear, however, that they have a certain degree of universal validity, for they can and should serve all interested parties (command, the air transport units, and the users of air transport services) as a point of departure for determining the most efficacious method of carrying out any air transport mission characterized by the same general conditions. Their significance should not be underestimated, for--in the same or similar form--they can often be adapted to fit conditions differing slightly in terms of geographical features, the general military situation, or the kind of mission to be accomplished, for example. Even so, there is no need to discuss them separately and in detail at this point, especially since most of them are treated fully in the reports of the individual airlift undertakings or can easily be construed from the evaluation made in the sections following the reports.

All those factors which clearly possess universal validity on the basis of the missions in which they played a part, but which are just as clearly bound to certain basic prerequisite conditions, are classified as principles of tertiary importance. For only so long as the basic conditions remain the same can they be utilized without modification. A basic change, however, in the technological development of transport aircraft, in the organizational structure of the air transport forces, or even in the over-all conduct of operations, inevitably implies a basic alteration in the employment principles if the latter are to remain valid.

There are only a few principles which are of primary importance. They are so inextricably bound to air transport activity



that they have always had a significance which is so fundamental that it is certain to endure as long as air transport forces exist and as long as they remain a definite factor in military planning. Such principles are completely independent of the developmental stage attained, of the point of time concerned, of the over-all military situation, and of the geographical conditions under which the commitment of transport aircraft takes place, and they are independent of any potential modification of these factors. Of these, there is one principle which is of basic importance to the successful employment of an air transport arm and which must be given primary consideration if the mission involved is to be a rational one and its accomplishment worthy of the sacrifice entailed. It is the following: The employment of aircraft for transport purposes is justified only when there is no other means of transport available which can be utilized with equal effectiveness to bring personnel and materiel destined for employment in a particular action to their area of operation within the time limit considered desirable or essential.

In substantiation of the above, the first point to be emphasized is the fallaciousness of the commonly-held view that air transport can handle a far higher total tonnage than the traditional surface transport means. This view is not only dangerous, but also inaccurate, as a glance at comparative statistics will show. The payload transported by air is always far less than that transported by truck and train, or by ship. Even the most generously constructed modern air transport fleet, supplemented in the event of war by requisitioned commercial transport space, would hardly be capable of transporting more than an insignificantly small percentage of the total tonnage to be moved.

Thus, military planners must be cautioned against overestimating the potentialities of air transport. Objectively considered, its overwhelming advantages lie in its comparative speed, in its independence of terrain difficulties, and in its relative adaptability to any specific military situation. It must be realized, however, that these advantages can be had only at the price of a highly unbalanced ratio of effort to gain.\* And this "lack of economy" cannot be ignored in the

---

\* One horsepower, for example, is capable of transporting the following payloads: in the air, 15-3/4 to 18 pounds; on the highway (automobile or truck), 90 to 202-1/2 pounds; by rail, 675 to 1,575 pounds; by ship, 2,250 to 9,000 pounds. In this connection, the reader is also referred to Friedrich Ruege, Seemacht und Sicherheit (Sea-Power and Security), Tuebingen, 1955.

planning of military transport missions. On the contrary, it must be one of the most important criteria in determining whether and, if so, for how long the employment of transport aircraft in moving supplies or other goods is necessary and rational and thus justifiable.

As far as combat employment in conjunction with parachute and airlanding forces is concerned, it goes without saying that the aforementioned principle is observed, for the transport of forces of this kind to their place of commitment can be accomplished only by air. It is equally clear that the continuing supply of such forces must also be carried out by transport aircraft until such time as the simultaneous operations on the ground have attained the goal assigned and are thus capable of establishing a surface supply line.

Similarly, air transport is the only possible means of furnishing supplies to a troop element operating in advance of its own lines or one which has been encircled by the enemy; in these instances there is no other way in which the element concerned can be provided with the supplies, personnel reinforcements, and weapons needed to maintain its fighting power. There is no other way in which to bridge the gap caused by interruption of the normal supply system. Therefore, in accordance with the criterion expressed in our basic principle, the sacrifices entailed in an air-supply action would seem to be justified. Nevertheless, one decisive question remains open--whether the troop element involved will really be able to accomplish its original mission with the help of air supply and, if so, whether this mission is sufficiently important to warrant the help. In view of the negative results of so many airlift undertakings, military leaders must be emphatically warned not to consider air supply the automatic answer to a situation in which no other means of transport can be employed, not even when there is plenty of air transport space available. An air-supply action can be appropriate and successful only when it is undertaken for a short, definitely limited period. In other words, it should serve merely to bridge a temporary gap, to help out in a tight situation. In the case of deliberately planned airlifts, these limitations can be definitely calculated in advance. In the case of an airlift made necessary by enemy action or by the over-all situation, however, the original goal of the force in need of supply by air must be carefully reevaluated and, if appropriate, modified, so that the air-supply undertaking may continue to meet the criteria established by the fundamental principle.

Air transport missions over one's own territory are deliberately subjected to strict limitations. Individual missions are carefully restricted in order to avoid the maintenance of a military air transport network. During periods when there are neither large-scale combat operations nor supply transport missions to be carried out, there exists a logical and understandable temptation to utilize transport aircraft for all sorts of missions involving the movement of personnel and materiel. These missions are, after all, a fast and comfortable means of accomplishing short-term and pressing errands. Very rarely, however, are they the only means by which the errands could be accomplished. And it is certainly clear that the same degree of gain presupposes a far smaller effort with any other means of transport than with an airplane. In the last analysis, practically any goal can be reached by other transport means with the same degree of certainty, if somewhat later, as with aircraft. Accordingly, satisfaction of the requirements set forth in the fundamental principle will probably have to be judged in terms of how much time is available in which to complete the mission. Justification for transport by air can be based only on the point of time by which the persons or things to be transported must be at their destination. This presupposes, in turn, that the cargo is not available at the point of departure in time to permit the use of any other means of transport, and that any later arrival at its destination would jeopardize the effectiveness of its commitment.

Within this fairly limited framework of criteria, there are a multitude of missions to be carried out, from the transport of a single planeload to a mass transport of supplies and forces. The distances to be covered range from home garrisons and training areas to the foxholes at the front, from centers of production and from supply depots to the advanced supply bases in the area of operation. The possibilities encompass the maintenance of a constant and diversified network of air transport actions as well as a sudden concentration of effort at some point along the front which requires the immediate commitment of all available transport aircraft. In any case, each and every instance of commitment should be carefully considered in accordance with the basic principle. Any tendency to relax its criteria must be vigorously combatted. Individually, violations of the principle may be of little consequence and will probably have no effect at all on the over-all operational effectiveness of an air transport arm. Nevertheless, every unnecessary commitment means unnecessary wear and tear on materiel, and this can make itself painfully felt when the time comes--either through deliberate planning

or through unforeseen necessity--to carry out a large-scale undertaking whose success may depend upon the volume of air transport space available. It lies in the nature of air transport activity that it is often impossible to determine the exact time and scope of commitment in advance. For this reason, air transport capacity must be kept continuously at the highest possible level by dint of sparing commitment, even though the highest demands made upon it throughout the entire course of a war may be less than the capacity actually available. During World War II, for example, if simple air transport missions had been firmly restricted in the beginning, many of the later difficulties occasioned by the acute shortage of air transport space could have been avoided. It is much easier to establish certain fundamental restrictions and then make occasional, clearly justifiable exceptions to them than to make a habit of planless and unnecessary utilization of air transport and then be forced by the inexorable pressure of circumstances to return to the original restrictions without being able to make even occasional exceptions.

To supplement the above, there is one other principle which should be mentioned, one which presents an apparent paradox at first reading. Actually, it merely formulates what we have already discussed in a way which can serve as a basis for the establishment of principles applicable to the methods of carrying out air transport missions. This guideline is the following: The first step to be taken before any air transport mission is begun must be a concentrated attempt to make that mission unnecessary.

There is no need to discuss this statement in detail. It goes beyond the criteria established by the basic principle only in that even those air transport missions which are deemed necessary and warranted must be preceded by intense efforts to find some other way out, for example: improvisation, rationing of supplies, modification or temporary limitation of mission in order to survive the delay until supplies can be transported by conventional surface means. Once all these possibilities have been exhausted or have been recognized to be unrealistic or uneconomical, then preparations must be initiated for an air transport mission. The following is a basic principle for the accomplishment of such missions: Any commitment of aircraft for transport purposes must be undertaken with the firm resolve to bring it to an end at the earliest possible moment.

This principle, of course, is based on the need to assure

rational utilization of the available air transport capacity and to avoid unnecessary exploitation and dissipation of the available forces. It is also based on the premise that the mission concerned has been adjudged necessary and justifiable and that it will be carried out. On the basis of the experience gained from the airlifts and air transport missions of World War II, there are three typical types of employment, depending upon the duration and scope involved. These are regressive employment, continual employment, and progressive employment.

#### Regressive Employment

Regressive employment, by its very nature, is always in full accord with the principle stated above. As far as duration is concerned, it nearly always follows a carefully planned and definitely limited time schedule; at the very least, its goal and scope are clearly defined. It is carried out in close conjunction with simultaneous ground combat actions whose goal in part is the establishment or reestablishment of normal supply lines based on land or water transport, so that the airlift can be gradually discontinued. It is quite irrelevant whether the climax in air transport activity comes at the beginning of the mission (as, of course, is normally the case in combat employment), or later on as the peak of a gradual increase in activity induced by developing bottlenecks or by mounting supply needs. The important factor is the firm determination to limit the duration of the mission in advance.

#### Continual Employment

Continual employment, which may be defined as the continuing commitment of air transport forces in missions of unchanging scope, is also capable of meeting the requirements of the principles established so far, at least in terms of its effects on the over-all air transport capacity. Continual employment is the term normally used to describe the establishment and maintenance of a military air transport network, though a somewhat modified interpretation is necessary in this connection. Obviously it would be pointless to establish such a network with the idea of utilizing it as sparingly as possible or of abolishing it at the earliest possible moment. There is, after all, a continuing demand for this type of air transport service, and it must be admitted that the furnishing of such service is one of the primary missions of an air transport arm. Any restrictions established in this

field must be based on the relative priority of the individual missions as compared with the over-all activity of the air transport forces, and once established they must be rigorously adhered to. If they are not, it can mean the beginning of an unhealthy increase in demand, leading in turn to the overburdening of the available capacity and thus to a violation of principle. In other words, continual employment ought to be no more than the sum of all individual missions.

In order to maintain continual employment effectively, there must always be a certain reserve available for commitment in case of the failure of technical equipment or its loss or destruction. Thus a certain amount of stockpiling of equipment is not only desirable but necessary.

#### Progressive Employment

Progressive employment, which is commitment to meet a steadily increasing demand for air transport services, can be justified only when it is carried out in conjunction with a carefully planned ground operation. For example, a troop element which is already dependent upon supply from the air might be brought up to combat strength for a particular operation by means of an increase in air transport activity. In such an instance, progressive employment represents an intermediate phase on the way to accomplishment of the original mission and thus plays a significant role in bringing about a probable success within a foreseeable time limit. In short, progressive employment under these circumstances is justifiable because it meets the criterion established by the first principle (there is no other means of transport available) as well as that contained in the third (the mission is begun with the firm intention of ending it as soon as the goal is attained). The steady increase in activity which characterizes progressive employment may also be due to the varying availability of air transport forces, that is, the necessity of first relieving them of other missions. Or, it may be due to an increase in the availability of cargo which depends in turn on the facilities available to transport goods to the point of departure, on the availability of the personnel needed to process them, on the efficacy of flight control techniques, and on the adequacy of the airfields in the take-off and target areas.

Progressive employment may also be justified during subsequent phases of a parachute and airlanding operation. It can also be

considered justifiable upon occasion when unforeseen circumstances require the continuation of a simple air-supply action of originally short duration. This, however, is the point which can give rise to the gravest of dangers; let us pause here to examine them.

In the case of an unplanned increase in the demand for air transport services, there are two factors which must be kept under constant observation and considered in terms of their potential effects. The first of these is the danger that the demand for air transport space may become so great that it far outstrips the available reserves of air transport personnel. The reasons for increased demand may lie in the inadequacy of earlier deliveries to the force being supplied, coupled with concurrent consumption of the supplies originally on hand. Or they may lie in a justifiable rise in requirements within the framework of a large-scale operation, for instance, in the need to equip a force for approaching action. In any case, the requests for expansion of an air-supply mission already under way must be subjected to the same prerequisites as applied to the original mission. The greater the gap between the air transport services requested and the air transport services actually performed, the more difficult it becomes, as time goes on, to catch up. A certain discrepancy is almost inevitable, particularly at the beginning of an air transport mission. In addition, there exists a certain tendency towards a gradual decrease in efficiency among the forces employed, which, of course, can be counteracted by the assignment of additional personnel. This means, however, that the additional personnel can no longer be utilized to increase over-all performance.

The other threat to the outcome of the operation as a whole lies in the failure to recognize the moment at which the performance level reaches the point of diminishing returns. Any attempt to boost performance beyond that point would inevitably jeopardize the nucleus of the air transport forces and, in many respects, that of the air force as a whole. And this must be avoided at all costs, for even if such jeopardy is not immediately apparent, it can have far-reaching and painful effects. In the last war, for example, the requisition of instructional personnel and aircraft from the Office of the Chief of Training to meet the initial demands for air transport services, and the resultant gap in the training of replacement personnel, provided a warning example.

Never should the attempt be made to achieve a hopeless

operational goal through the progressive employment of air transport forces. Any responsible military leader must make it a rule to adhere strictly to the aforementioned principles of commitment in such a case. The proper solution is the modification of the operational goal in accordance with the limitations and possibilities inherent in the developing military situation. And such modification must be effected before it is too late to save the force involved on the one hand, and before all the previous sacrifices of personnel and materiel become futile and pointless on the other. It will probably always be characteristic of an air transport force that any increase to the point of maximum capacity is bound to involve a certain degree of risk. An increase beyond this point, even when it can be met over a short period by the consolidation of all available forces, is even more dangerous.

In the last analysis, success is not only a matter of the total tonnage transported, but is dependent upon a multitude of other factors, such as the effectiveness of technical services, the capacity of facilities in the take-off and landing areas, the standard of training, and even upon weather conditions. The tragedies which Germany experienced during the last war (Stalingrad, for example) demonstrate clearly the wisdom of revising original operational goals in time and of utilizing air transport services, an extremely costly kind of activity, as a means of creating the necessary prerequisites for a lesser goal or, as a matter of fact, for a well-executed retreat if existing conditions should dictate it. Under these circumstances, progressive employment would be turned into regressive employment.

And this leads us to the next (and fourth) fundamental requirement, which must also be viewed as a principle for the commitment of air transport forces. The goal of an air transport mission must not be merely that of establishing contact with the force in need of air transport services. The mission must be an integral part of an over-all military operation. Air transport can never be an end in itself.

The commitment of tactical and strategic air force elements, either independently or in conjunction with one another, may be viewed as separate combat actions. The bombardment of targets lying behind the enemy's front lines and the counteracting of enemy ground and air defenses are carried out with the idea of weakening or destroying the power of the enemy. In contrast, the accomplishment of an air transport mission never has a direct effect on the enemy forces. It is always limited by the goals already attained by the force it is assisting.



and its success can be evaluated only in terms of the success achieved by the troop element concerned, provided that this latter success was directly dependent upon the commitment of air transport forces.

Here again, combat employment in conjunction with parachute or airlanding forces would seem to represent the ideal method of commitment for the air transport forces. It complies in every respect with the requirements so far established, including that contained in the last-mentioned principle. The commitment of a parachute troop is clearly an offensive action and, in a sense, the activity of the air transport forces is also offensive, since it is not restricted merely to maintaining contact between the take-off and target areas, but has a clearly defined role in the over-all accomplishment of a military undertaking. In the first place, it is the commitment of air transport forces which makes accomplishment of the mission possible and, in the second place (in its role as the means to an end), helps to keep it active, to expand it, and to guide it to a successful conclusion.

In exactly the same way, any rational air-supply or air transport action must be connected, directly or indirectly, with an offensive operation. The concept "offensive" in this respect may be limited to the restricted activities of the force receiving air transport services. It is quite irrelevant whether the force concerned fights its way back to its own lines or whether an attack is launched from the front in order to relieve it; in either case, the over-all picture may be characterized by defensive rather than offensive fighting. In any event, that aspect of operations involving the commitment of air transport forces is directly connected with offensive action, for one of two alternatives must apply: 1) the employment of air transport forces brings about the prerequisites for a successful breakthrough of enemy encirclement, or 2) air-supply action maintains the encircled force at a level of survival and fighting power until the attack launched from the front can reach its goal of freeing it.

There are two historical undertakings which deserve further study as ideal examples of the above; as such, they illustrate the correctness of the principles stated so far much better than any theoretical argument. The first, the retreat of the First Panzer Army,\* was, in itself, an offensive action carried out in the midst of a

---

\* See above, p. 242 ff.

predominantly defensive operation. The air-supply services furnished the First Panzer Army, encircled by the enemy but still relatively mobile, made it possible for the Army to fight off the enemy and to reach the German front line, thus staving off total defeat and destruction. Air transport, in other words, was a significant factor in the successful outcome of the action. The second example, the air-supply action at Demyansk, \* would have been thoroughly justified from at least one standpoint (despite the many other factors which clearly stamped it as a "negative success") if the fortress, maintained at great sacrifice for months, had had real military significance for the spring offensive of 1942. Unfortunately, however, the air-supply missions--noteworthy feats in themselves--were a disproportionately high price to pay for the advantages inherent in having the forces still available in that area for further operations.

Any group of military planners must be clearly aware of the fact that they possess, in a well-prepared and highly capable air transport arm, an instrument with which they can master unusual situations in an unconventional way. And this instrument must be put to good use in the event of war. Good use, however, presupposes rational, carefully-planned, and purposeful employment. The operations of the other air force branches are characterized by a certain degree of independence, and their employment need have no direct connection with the operations taking place on the ground; nevertheless, bombers, fighters, and close-support aircraft are not committed simply because they happen to be available. Nor are they committed in missions for which their particular performance characteristics make them highly unsuited. Their primary mission will always be one of carefully coordinated activity within the framework of the over-all operation, so that the successes gained through their employment will always have the effect of relieving or of supporting the joint operations of all elements of the armed forces. It is not only desirable but imperative that this criterion also be applied to the employment of an air transport force.

In the following sections, which give a detailed presentation of the employment principles applicable to the air transport forces, we shall deal with universally valid guidelines which have been derived from the lessons of experience taught by the last war. Recognition and acceptance of these principles will give us a number of hints as to

---

\* See above, p. 137 ff.

how future air transport missions can be accomplished more easily, more economically, and more successfully by means of detailed preparations, firm organization and leadership, and a multitude of precautionary and preventive measures.

## Section II: The Preparations for Employment

### A. General

Careful, detailed preparation is the key to successful accomplishment of any air transport action.

In the case of combat employment in conjunction with parachute and airlanding forces in World War II, there was never any doubt but that the requirements of the flying forces were given due consideration within the framework of preliminary planning and preparation. A smooth and uninterrupted accomplishment of the action concerned, akin to the smooth and frictionless workings of the various parts of a clock, was absolutely necessary. In fact, it was a matter of life and death for the forces set down in the midst of enemy territory. Even in the case of operations dictated by a sudden change in the overall situation and thus decided upon at a moment's notice--in short, operations necessarily characterized by a certain degree of improvisation--these requirements were never neglected. Every wrong decision and every instance of neglect could have had far more serious consequences for the forces delivered by air than for the air transport forces.

Almost all of the air-supply and air transport missions, by contrast, were characterized by a lack of careful planning. Experience has shown that they were usually built up from individual transport flights which increased steadily in scope and frequency, and this pattern of development is clearly recognizable in all but a very few of the airlift undertakings carried out during World War II. On the Eastern front, particularly, "preparations" were never begun until enemy encirclement of a force had already taken place or was absolutely inevitable, and once begun they were hurried and sketchy. In retrospect, it must be admitted that the responsible military leaders clung incredibly long to their overly optimistic appraisal of the general situation, although it was clear that the supply function was slowly, but nonetheless steadily, becoming a matter for the air transport forces. The officers in charge of the individual air transport units

could not be expected to evaluate this trend objectively or soberly. They were far too busy with the immediate problems and difficulties occasioned by the intensive employment demanded of their units; the constant overburdening of the available forces was beginning to make itself felt. In any event, by this time "guidance" from top-level command agencies had become a hopelessly illusory concept, for air-supply operations had already become an accepted emergency measure. Unless there was intervention from the air the troop element concerned was consigned to certain destruction. Time was of the essence. The supplies on hand were exhausted, the reserves already tapped, and the encircled force was existing from hand to mouth. It soon became apparent that the available air transport forces were nowhere near able to provide more than a fraction of the supply services demanded. The assignment of additional transport units was no longer a question of operational planning but had become absolutely imperative under the inexorable pressure of events. And the original mission, its scope and duration clearly limited, suddenly began to mushroom into an operation whose potential scope and duration could no longer be foreseen. This sort of development could have been avoided if military leaders had insisted upon timely and professional preparations for each and every air transport mission.

#### B. The First Steps

Ideally, preparations for an air transport mission should be initiated as soon as military leaders are aware that there is an even remote possibility of the need for such a mission. This awareness may be the result of deliberate planning, or it may arise in connection with sudden decisions dictated by developments in the over-all situation. In any case, military leaders must be expected to have a general understanding of the principles governing the employment of air transport forces. Logically, then, the first step should be to contact the Headquarters, Air Transport Forces\* or one of its subordinate agencies; the second step should be joint evaluation of the situation in order to determine whether the commitment of air transport forces can be justified on the basis of its being the only possible way to uphold supply deliveries, what developments in the type and scope of a potential mission must be anticipated (assuming the worst as far as development of the over-all situation is concerned), and whether or not the mission

---

\* See below, p. 338.

is feasible on the basis of the air transport strength already on hand and that available for assignment to the operational area involved. There are a number of highly important factors--one's own military situation and that of the enemy, one's own plans and those of the enemy (insofar as the latter are known or can be discovered), over-all military strength, available striking power, the adequacy of available equipment stores, and the volume of supply deliveries needed--all of which must be ascertained and evaluated in close coordination with local command headquarters and with individual commanders at the scene of operations. These factors must serve as a basis for determining the probable minimum supply needs which would have to be met by air in the event of total elimination of other means of transport. In a sense, of course, they also determine whether or not sufficient air transport space (including all available reserves) is available or can be made available.

Evaluation of these factors should be started at the earliest possible moment. This is the only way to assure that there will be sufficient time to implement operational or tactical decisions resulting in a change of operational goal, or to begin work on the preparatory measures so necessary to the smooth initiation of an air-supply action. Responsible leaders from the air transport sector must be available for all preliminary discussions and conferences, leaders who possess a clear understanding of the over-all air transport situation. This is obviously not a mission which can be entrusted to the commander of an air transport unit who just happens to be available because his unit is being committed in the area. It is far more desirable to have it handled by his direct superiors, who are familiar with the local situation. Thus, the field commanders would not be overburdened with responsibility for preliminary preparations. Even so, on-the-spot observation by the superiors would guarantee that front-line opinion would not be ignored. As a matter of principle, these preliminary steps should be carried out irrespective of whether or not the mission is actually undertaken.

C. The Work of the Preparations Staff and the Mission Commander

Once it has been determined with a fair degree of certainty that a large-scale air-supply operation is inevitable and that the air transport forces needed can be made available, the Headquarters, Air Transport Forces, (or perhaps an agency subordinate to the latter,

depending upon the scope of the mission concerned) must appoint a "mission commander" to take charge of detailed preparations. The practice of concentrating all the responsibilities pertaining to a single undertaking in the hands of a single mission commander proved to be highly satisfactory during the last war and is thus recommended for adoption in any future air transport arm. Under the leadership of the mission commander, the chief burden of preparation can be borne by a small staff of experts, termed Preparations Staff in the beginning and Operations Staff later on.

One of the first jobs to be accomplished by the Preparations Staff is the ascertainment and evaluation of topographical conditions, airfield availability, possible detour routes, available technical ground services and facilities, and other essential information within the target area, most appropriately in close coordination with ground organization agencies. Any improvements deemed necessary should be initiated immediately so that surface communications and transport facilities can be fully exploited as long as they are available. In this way, for example, the capacity of the target area for handling air-supply delivery can be considerably increased by bringing in supply transport vehicles, bulldozers, radio equipment, airfield equipment, and auxiliary loading equipment. This bolstering of the ground organization can be carried out without attracting undue enemy attention.

At the same time, contact must be established with the commanders of the troops assigned in the threatened area and, above all, with the local agencies responsible for keeping them supplied. Early orientation as to the kind and scope of the preparatory measures required is extremely advantageous. Despite the obvious fact that it may be psychologically undesirable to admit the probability of an enemy encirclement action, both command and troops will certainly derive some degree of comfort and confidence from the knowledge that definite plans are in the making to assure their survival and the maintenance of their fighting ability by recourse to carefully prepared air-supply operations. Troop commanders in the endangered area must be informed of the plans for air-supply actions, so that they will realize that the projected landing fields must be given high defense priority and held at all costs. The majority of available defensive weapons must be concentrated at these airfields, the areas immediately

adjoining them, and the aircraft approach lanes, in order to provide as much ground-to-air support as possible for the transport forces.

Care must be taken to assure that all parties concerned, down to the lowest echelon, are informed of the method to be followed before the action reaches its climax. This is the only way to make sure that each and every officer is capable of initiating the proper measures (i. e., those measures most beneficial to over-all success) in special situations such as emergency landings short of one's own lines, attack by enemy fighter aircraft, and the landing of parachute forces. In addition, a general orientation of this sort will do much to promote cooperation and mutual confidence.

The local supply agencies within the threatened area must be consulted as to the most effective methods to be utilized in an air transport action, the further transport of the unloaded goods to their final destination being a question of paramount importance in this connection. Careful consideration must be given to the problem of establishing suitable transit supply depots in the vicinity of the landing areas in order to eliminate the possibility of a bottleneck. The available supply points, under normal conditions established along a line staggered in depth, must be gradually moved in to the center of the threatened area to obviate the danger of their falling into enemy hands which, of course, would mean an unnecessary increase in later supply requirements. Moreover, it is highly desirable to begin the rationing of the supplies already on hand as soon as possible after the danger of encirclement is recognized. This, too, will help to keep later requirements at a minimum. A clear understanding of the situation on the part of all concerned will do much to facilitate preliminary preparations and can be of great advantage if and when the air transport action actually begins. Even if, as a result of the general improvement of the military situation, it then proves possible to maintain the normal surface supply network and to dispense with air-supply operations, the accomplishment of these preliminary measures will have done no harm.

The most urgent task of the Preparations Staff must be to equip the take-off area as a suitable base for large-scale airlift operations, a base capable of meeting anticipated demands without difficulty. The first step, to be accomplished in coordination with the local agencies of the ground organization, must be to determine the size and location of airfields and the size of the force which they can

accommodate, to select suitable alternate landing areas, and to find out the scope of available technical services and facilities.

In general, the possibilities in the take-off area are considerably greater than in the target area, chiefly because the former can be more easily expanded. On the other hand, it will probably always be in the best interests of the air transport forces to keep the individual airfields or airfield area as close together as possible, since geographical separation usually increases the difficulty of an air-supply mission. On the basis of the information gathered during this initial investigation, the headquarters of the air transport forces must be informed of the minimum personnel and materiel requirements deemed necessary to maintain operational readiness during the undertaking.\*

The strengthening of ground organization services and facilities for the additional demands to be made upon them is sure to require a certain length of time; for this reason it is imperative that preparations be begun, or at the very least that planning be undertaken, well in advance. For any increase in ground organization effectiveness must involve the following: 1) establishment or expansion of airfield command headquarters or airport commands, 2) expansion of technical services, 3) establishment of spare-part stocks for the various types of transport aircraft, 4) construction of loading areas and the procurement of loading equipment, 5) expansion of the existing communications facilities and of the flight-control network, 6) increased procurement of gasoline supplies and construction of additional fueling facilities, 7) construction or expansion of aircraft parking areas, and 8) provision of billeting, mess, and other logistical facilities required to accommodate the air transport units.

It is likely that the airfields in the take-off area will already be occupied to capacity by units belonging to the tactical air arm. Therefore, it is absolutely necessary that the commanders of the latter units be informed of impending air transport operations. And since the need for an airlift undertaking is most apt to arise at critical points along the front, coordination of the activity of all the various air units stationed within the critical area is of the greatest importance, especially since many of the missions carried out by the tactical units (for example, escort duty, fighter scrambles, and close support

---

\* See below, p. 375 ff.



actions at the edge of the encircled area) will be directed against the same target.

Another aspect of the task faced by the Preparations Staff in the take-off area is coordination with the users of air transport services in order to reach agreement on the scope and method of such services. To this end the Staff must make early contact with the local procurement and supply agencies and with the local commander of transport activity of the headquarters having over-all jurisdiction over the operational area concerned. It can be assumed that the basic questions will already have been settled at higher command echelon; thus the chief purpose of liaison at this point will be to work out jointly the practical details involved in the actual carrying out of the mission.\* This joint planning must establish a clear delineation of responsibility for ground organization, supply, and air transport activity; it must assign responsibility for each and every operational aspect of the over-all undertaking. Only in this way can a later overlapping of areas of authority and responsibility be avoided. On the other hand, the finished plan must not be so rigid and inflexible that last-minute changes, special wishes, and unforeseen requirements cannot be handled satisfactorily through direct agreement with the parties concerned at any level within the over-all hierarchy. The fundamental principle to keep in mind here is that every specialized function must be viewed as a part of the over-all task, and its fulfillment as a means to an end rather than as an end in itself.

The preliminary preparations described above create the framework for an airlift undertaking, a framework to be filled in by the details of practical accomplishment once the operation is ordered. It is obvious that not every undertaking can be preceded by such painstaking and time-consuming preparations. Often, last-minute decisions on the part of command, taken on the spur of the moment without any attempt to check on the operational readiness or momentary capabilities of the air transport forces, make heavy demands upon the latter. In such a case, the preparatory measures discussed must under no circumstances be permitted to hinder or delay the launching of a necessary air transport action. Instead, they must be either accelerated by a reinforced preparations staff, with all aspects being dealt with simultaneously, or undertaken step by step and integrated

---

\* See below, p. 380 ff.

into the operation already under way. The framework created is the same, whether it is established in advance or retroactively. It must be the common goal of all concerned to protect the operation itself from all jeopardizing factors and to catch up on what has been missed as rapidly as possible. Those in direct charge of operations must be relieved of all extraneous demands, so that they may concentrate their undivided attention on the countless details involved in carrying out the undertaking.

### Section III: The Conduct of Operations

#### A. General

The German air transport forces lacked a uniform and centralized organization and chain of command during the war.\* This lack of a central command agency had adverse effects not only on the development of air transport as a whole and on the organizational structure of the individual air transport units, but also on the actual carrying out of air transport missions. Through the direct subordination of air transport groups or squadrons to the highest-ranking command agency in the operational area concerned (air fleet command, air corps headquarters, or air district command) the over-all conduct of their operations, in every respect, was automatically the responsibility of the commander concerned. As a result, the majority of missions took the form of simple air transport actions at the behest of the local supply agencies. Orders from higher command headquarters were exceptions to the rule. Hence, it was only the transport aspect which had a firm and consistent framework within which to function. The supply agency involved (senior quartermaster, quartermaster) obviously had no authority to interfere in the chain of command of the air units in order to deal with the technical aspects. Thus it was nearly always up to the ability and initiative of the air transport unit commander to negotiate out of channels with the local ground organization agencies or with command agencies in other operational areas.

On the other hand, air transport missions had to be integrated into over-all operations if they were to have the benefit of those operational prerequisites which the transport forces had neither the

---

\* See below, pp. 337-338.

opportunity nor the authority to establish for themselves. The right to exercise any influence on the scope of a mission or to deliver any judgment as to its appropriateness or futility could hardly be imputed to the individual unit commanders. Nor, indeed, would this have been desirable.

As long as the scope and potential significance of the missions did not exceed the capabilities of the air transport units, independence of action was acceptable. All the same, in any future air transport arm this situation should be avoided at all costs, for it brings with it a number of decided disadvantages as far as the over-all organizational structure is concerned.

Whenever the demands increased beyond the point where they could be handled by standard procedure, the system of independent command was bound to collapse. The arrival of additional units with the same mission resulted in an increase in the scope of the over-all operation and made a firmly-organized, centralized command agency an absolute necessity if the expanded force was to attain the full effectiveness of which it was capable. In such a situation, since there was no established and experienced command hierarchy available, the conduct of air transport activity was either entrusted to the highest-ranking commander in the area, or the highest-ranking "supply agency" (Branch 4, Office of the Quartermaster General, Luftwaffe General Staff), which appointed an air transport commander to take over. This position, together with a small operations staff, was set up by special order. The staff, because of the highly specialized abilities concentrated in it, was capable of handling all those tasks directly concerned with the conduct of the mission. As far as all other aspects were concerned, for example, troop administration in connection with such matters as awards, promotions, and transfers, its authority was extremely vague, although here, too, a firmly established hierarchy of responsibility would have been most desirable.

In the future, care must be exercised to make sure that troop administration as well as the conduct of operations are in the same hands and that there is a tightly organized chain of command leading from the top-level command headquarters through air commander, wing, and group down to the smallest organizational unit. Even under such a system, the group commander and his staff can and should retain a greater degree of freedom as regards the practical accomplishment of individual missions than can be the case in other service

branches. For it is quite within the realm of possibility that all the groups of a given wing may not be employed in the same, or even adjacent operational area. As a result, the wing (in addition to certain other functions which will be dealt with later) will be forced to set up one or more operational staffs in order to be prepared for the eventuality of commitment either as a closed unit or as separate groups. These staffs will have preparatory functions to begin with and later on will take on the role of operations staffs. This potential necessity must be taken into account in the organization of a wing staff.

#### B. The Operations Staff

The assignment of a special operations staff is a practice which proved most satisfactory during the war and one which should be retained in the future. Within the framework advocated for the future, however, such a staff should be an integral part of the overall organization, and its assignment should neither interrupt nor alter the existing chain of command. Its missions and authority should be determined exclusively by the operation to which it is assigned and should be strictly limited to that operation. For all other matters, it should be merely a transmitting agency, forwarding matters to the appropriate branches of the wing staff concerned for action.

The composition of a special operations staff will depend upon the scope and importance of the undertaking involved. The most important functions, apart from those of the mission commander himself, are those of an operations officer, a technical officer, a communications officer, and a transportation officer. In addition, supply agency headquarters will assign a liaison officer to the staff. If conditions in the target area deviate from the norm, assignment of a liaison officer from the unit (or units) utilizing air transport services may be desirable.

1) The Operations Officer. The operations officer, as the right hand of the mission commander, is responsible for all operational aspects directly concerned with the accomplishment of the mission. These include: a) deployment of the units concerned, b) preparation of employment orders, c) making arrangements for fighter aircraft support or for fighter escort, d) evaluation of the enemy situation, including evaluation of intelligence information presumably available to the enemy, from the point of view of the commitment of air transport forces, e) determination of personnel requirements and the

preparation of requests for additional personnel, f) handling of combat reports and reports of personnel and materiel losses, and g) maintenance of contact with other command agencies within the operational area concerned.

2) The Technical Officer. The technical officer is responsible for handling all matters connected with the maintenance and furtherance of operational readiness in the technological sector. These include the following: a) supervision of technical maintenance, b) distribution of aircraft, c) assignment of damaged aircraft to maintenance workshops and aircraft repair depots, d) supervision of aircraft repair, and e) distribution of technological equipment and technical personnel. He is also in charge of the procurement, transport, and allocation of gasoline and lubricating fuels, as well as of refueling operations.

3) The Communications Officer. The communications officer is in charge of signal communications in the operational area insofar as they are needed for the accomplishment of the air transport mission concerned. He must, in any event, assume responsibility for seeing that the communications aids needed for the conduct of air transport activity are available and in good functioning order.

4) The Transportation Officer. The transportation officer is responsible for all transport-technical aspects of the air-supply operation. It is his job to adapt the supply requirements of the beleaguered forces to the air transport space available and, on the basis of his evaluation, to submit his recommendations to the mission commander. He is also responsible for seeing that the necessary aircraft are available when they are needed, for organizing loading operations in the take-off area and unloading operations in the target area, and for supervising the transport of personnel and materiel out of the target area. It is imperative that he maintain close and constant contact with the transportation officers of the supply agencies involved as well as with those of the forces utilizing air-supply services, so that he may be in a position to adapt their needs and wishes to the practical framework established for accomplishment of the mission.

5) Liaison Officers. If there are liaison officers assigned, it is their primary task to assist the transportation officer in those fields in which they are experienced and to handle, independently, certain aspects of the over-all operation which fall into their specialized fields. They must possess the authority to issue orders and instructions

on behalf of their superior headquarters.

The missions of an operations staff, as described in detail above, will be the same or very similar at all echelons of command. If the operation is of very small scope, they can, if necessary, be handled by a single, well-qualified officer. On the contrary, if the scope involved is very large it may be desirable to break them down even further and to delegate them to additional personnel.

The employment of special operations staffs will assure that the countless details involved, the majority of which are only indirectly related to the actual transport flights, do not have to be handled as an additional burden by the transport unit staffs. It follows that the officer having over-all command of the participating units should be the one assigned responsibility for operations. A squadron captain, for example, whose place is definitely with his squadron, should not be assigned over-all responsibility for several squadrons. A group commander and his staff cannot be expected to act as operations staff for a number of groups if their own group is taking part in the operation. In a large-scale action involving mass air transport, it is all the more imperative that the conduct of operations be handled by a superior headquarters. For the operations staff must be above individual happenings; its main job is to coordinate all the requirements, demands, and wishes of the forces utilizing air transport service, the forces providing it, and the forces handling the supply function.

#### Section IV: Accomplishing the Mission

The goal of every air transport action is the movement by air of personnel and/or materiel, within the capacity of the transport aircraft employed, from a take-off field in the vicinity of their assembly area to a landing field in the vicinity of their destination. Once all those prerequisites having to do with technical facilities and services and with the procurement and surface transport of the cargo to the take-off area have been met, there remains only the need to determine which factors are significant as regards the kind of action and the method of its accomplishment and what effects they may have on performance capacity.

##### A. Training Standard

The training standard of the crews involved is the determining

factor in deciding whether or not the action can be carried out with relative independence of weather conditions or whether it can be undertaken in night employment as well as during the daylight hours. One can never expect perfect uniformity in the training standard. Thus, in the case of mass employment, the proficiency of the weakest crew must be taken as a criterion. If heavy demands on ability are anticipated, then it is wiser to leave some crews on the ground than to force their participation and thus to risk the loss of personnel and aircraft.\* The transport capacity "wasted" thereby will be compensated for again and again in subsequent actions carried out under more favorable conditions. In the case of a continuing series of transport actions, the squadron leader must take care to assign his crews in accordance with the degree of difficulty involved. He alone is in a position to judge whether or not each individual is capable of meeting the demands to be made upon him. Any attempt to force an increase in performance effectiveness must be avoided, for losses attributable to such an attempt would have a far more detrimental effect on morale than can be balanced by a momentary success. It is wise to adhere to this principle even if the apparent urgency of a mission would seem to warrant the taking of any and all risks. There are very few missions of such decisive importance that they cannot be evaluated by this criterion.

The system of assignment advocated above is also an excellent way in which to provide younger crews with combat experience by gradually increasing the difficulty of the actions in which they participate.† It is not the total number of aircraft available--not even the number of aircraft ready for immediate operation--but the number of aircraft ready for operation together with the number of crews available and qualified for employment which provides a basis on which air transport capacity can be calculated.

#### B. Type and Scope of the Mission

These two factors determine the measures which must be taken by the commander of the air transport units in order to assure effective accomplishment of the mission. If there are no limitations

---

\* As was the case during the employment of the 2d Group, 1st Special Duty Bomber Wing

† See below, pp. 344-345.

imposed by the ground organization situation in the take-off and landing areas, the next step must be an estimate of the total transport space required to meet the goal of the operation. The number of missions needed can be reckoned on the basis of the ratio between the amount of transport space required, the number of transport aircraft available and the time limit set for completion of the mission. In the case of large-scale undertakings extending over a fairly long period, the computations should include certain reserves in order to make up for such factors as losses, technological failures, and obsolescence of materiel. These reserves can either be held in readiness or gradually brought into action to counteract the natural reduction in operational readiness. Once all the available aircraft, including reserves, have come into action, their over-all average performance must correspond fairly closely to daily requirements. Which of the two methods is the more appropriate is something which must be decided by the mission commander in each individual case after due consideration of all the circumstances involved.

C. The Relation Between Airfield Conditions and Formation Flights

Once the framework of an air transport action has been defined in terms of method and scope, the next point to be decided is whether it is to be accomplished in closed formation or in a series of single flights. Closed formation is always the more desirable solution. It permits far better exploitation of the time available, assures greater transport volume, and facilitates the conduct of operations. Apart from the enemy situation (which will be discussed in greater detail later on), the most important factor in this connection is the condition of the airfields in the take-off and target areas. Limited airfield capacity, restricted take-off or landing facilities, or the absence of suitable loading equipment may make operational separation of the participating units a necessity; in other words, the units must be subdivided and the various subdivisions required to carry out the mission from separate airfields. Under these conditions, there is little point in trying to coordinate take-off times and to unite participating aircraft during the approach flight unless it is absolutely necessary that they arrive at their destination in closed formation. If the latter is the case, and if the unfavorable airfield conditions are such that they affect only the take-off operation, then the participants can be assembled over the main airfield and brought into formation during the flight.



The conditions obtaining in the target area offer far less opportunity for such maneuvering, especially if all participating aircraft are not able to arrive at the same time. The proper strength for a transport "wave" should be so determined that landing, unloading, and take-off operations can be conducted simultaneously. Congestion on the taxiway or at the take-off and landing runways, however, must be avoided at all costs. Should particularly intensive employment be required during a transport operation carried out under unfavorable airfield conditions, the best solution--as indicated by experience during the last war--is the consolidation of aircraft into "Pulks."\* This method affords the highest possible degree of flexibility and adaptability. Their strength varying between five and thirty aircraft, these Pulks could take off in rapid succession, and the member aircraft could be assembled into formation smoothly and without loss of time. Just short of their target, they could be quickly regrouped and gotten in line so that they could land one after the other at short intervals of time. Under these circumstances, congestion along the taxiways to the unloading areas and at the loading areas themselves would be highly improbable. After being unloaded, each aircraft is free to take off at once, either in the same group or as part of another, in order to be out of the way by the time the next Pulk is due to arrive (if necessary, their take-off could coincide with the landing of the next wave). There would be no need to wait for stragglers before taking off, for these could simply join the next Pulk for the return flight.

This system of employment must become second nature to the air transport crews. It seems to reduce to a minimum bottlenecks in the target area, loss of valuable time, and the danger inherent in remaining in the vicinity of front-line airfields or near an enemy-encircled area. It also guarantees full utilization of available transport space in the face of restrictions imposed by time limits during short daylight hours and unfavorable weather conditions. If the target area is able to provide only a limited number of landing possibilities, this method of employment assures that they will be exploited as rationally as possible. This system is also flexible enough to ensure that those in charge of operations can take full advantage of any time gaps arising as a result of accelerated processing at the target

---

\* Editor's Note: Originally a Slavic term designating an army regiment, "Pulk" was used in the Luftwaffe to indicate a formation of variable size.

airfields. By the same token, incipient traffic jams within the landing area (the avoidance of which is particularly important in air-supply operations to encircled forces) can be recognized immediately and the necessary preventive measures taken.

As a matter of principle, any transport flight subject to the limitations imposed by unsuitable airfield conditions should be planned along the simplest possible lines. Complicated time schedules, sequences of action, deadlines, precise plans to assemble or disperse aircraft in the air, arbitrary assignment to specific flight routes or to specific positions within the over-all formation--all of these things can be far too easily upset by unforeseen developments. And, as experience has shown, once they are upset the result is usually total chaos. In other words, the possibility of a tremendous success is coupled with an equally tremendous risk, which could contribute significantly to the failure of the over-all undertaking.

#### D. The Enemy Situation

As a last, but most significant factor, the military situation--and particularly the enemy situation--exercises decisive influence on the accomplishment of any air transport action. In fact, it determines conclusively whether or not the principles so far discussed are applicable. In the event that there are several possibilities open, this factor will frequently determine which one must be selected. In selecting the airfields to be used as take-off bases, it must be determined whether or not a concentration of transport aircraft is feasible from the point of view of possible enemy air attacks on these bases. The relative importance of an air transport action must be gauged from the enemy's standpoint.

Another factor which must be determined is the degree of air superiority held by one's own side. It is, of course, clear that a mass take-off from a single, central airfield with large capacity is far less trouble than separate take-offs from scattered airfields. However, if the take-off is obstructed by a concentrated enemy attack or by continual enemy harassment, the success of the entire operation can be placed in jeopardy. In the face of potential developments of this sort, it is wise to operate from previously agreed-upon groups of airfields. This method offers a broader basis of operations, with increased detour possibilities, and neither reduces the transport volume nor increases materially the difficulties connected with the

operations.

Regular repetition is to be avoided in all phases of the mission. Even such primitive measures as lengthy detours and approach from a different, unexpected direction can serve to prevent losses. Continual reconnaissance over and at the edges of the encircled area is of the greatest importance in guarding the transport forces against unpleasant surprises. An unsuspected marshalling of enemy troops to form a strong, well-camouflaged defense pocket can, for example, lead to such high losses as to render the success of the over-all operation extremely questionable.

Not until enemy defenses at a number of points have become so concentrated that frequent changes in route are no longer capable of bringing relief is it necessary to switch to flight operations at a higher altitude. In operations of longer duration, regularity must be avoided so that the transport aircraft will not find themselves confronted by waiting enemy fighters as they enter the target area. A change in flight routes during short-range missions is not likely to be very effective, inasmuch as the target area remains the same.

In the absence of friendly air superiority within the area of operations, successful completion of the air transport missions should never be made dependent upon the mere chance that there may be no enemy fighters in the vicinity. As a matter of fact, such missions should not even be initiated unless there are sufficient forces available to provide an adequate fighter escort. And these fighter forces must be available in sufficiently large numbers to complement the transport forces. Anything less than this must be considered a half-measure, and is not to be relied upon in a crisis. All previous agreements regarding such matters as rendezvous points, reception areas, and escort relief are subject to and influenced by so many uncertain factors that a reason for failure can always be found. The losses incurred, however, can never be made up. Only unified, direct command of both forces, coupled with an exact knowledge of the number of aircraft in action at a given time, can assure that there will always be adequate fighter support available in those areas where it is needed for air transport operations. A successful enemy coup traceable to a lack of coordination on one's own side can create a gap incapable of being closed within a short time. It can even force the surrender of the encircled troops, for after a short period without badly needed supplies their powers of resistance will be broken down entirely.

It is not intended at this time to formulate guidelines for the coordinated employment of transport and fighter units. Technological developments, particularly in the field of fighter aircraft, have progressed considerably, so that a conventional fighter escort of the type in use during World War II has presumably become obsolete. The primary mission of the fighters in future wars will probably be to keep the operational area free of enemy aircraft. In the event that the operational area cannot be secured satisfactorily from enemy aircraft, it may be necessary to switch from daytime to night missions. During the last war, missions were frequently carried out at night for this very reason, and with relatively good success. In comparison with daylight missions, night operations were subject to considerably more difficulties, which tended to reduce their effectiveness. The majority of such difficulties, however, were inherent in the technical inadequacies of that time in the fields of navigational aids, take-off and landing devices, target markers, and the like. The rapid progress achieved in these fields since the war, including the improvements in radar, could give an entirely different picture of such operations today.

It would be pointless to attempt to formulate rigid conclusions and guidelines for the future from the lessons taught by the missions of World War II, missions in which improvisation was all too frequently the rule rather than the exception. The technological aspects have changed far too much in the meantime. Even so, future commanders of an air transport mission might well be confronted by very similar problems in the event that the extremely complex technical aids should, for one reason or another, be prevented from functioning smoothly. In such a case, the optimal accomplishment of a night transport mission during World War II might well serve as a criterion.

The most important principle to bear in mind in assuring the highest possible degree of effectiveness in a night or bad-weather mission is that the individual aircraft must take off and land in regular succession. They must be guided individually or, if visibility is unusually good due to moonlight, in groups of two or three from their take-off base to the target area by means of a radio beacon. The flight route utilized and the speed maintained must be uniform for all participating aircraft. If possible, each aircraft should be equipped with radar, enabling the pilot to check continually on his distance from the aircraft flying ahead of him. During the second half of the approach flight, the aircraft must be picked up by a radio beacon originating from the target airfield and utilizing the same frequency as the beacon

from the take-off base. By means of prearranged signals, each pilot will be able to determine his distance from the target and the flight altitude necessary. Once the transport aircraft are over the target area, searchlight signals from the ground will provide additional help, especially during landing operations.

If the entire procedure--approach flight, landing, taxiing to the unloading area, unloading, take-off, and return flight--can be made to function as a smoothly repetitive cycle then it will be possible to carry out a relatively large number of air transport missions in quick succession. The radio beacons, their roles reversed for the return flight, can help to regulate air traffic between the take-off and target areas in such a way as to avoid any conflict between approaching and departing aircraft. It is obvious, of course, that these methods will not suffice to carry out a really large-scale airlift action; however, they are adequate to assure that supply needs, at least as regards the most vital items, can be met on an emergency, short-term basis. The feasibility of this method, needless to say, should never be applied as a criterion in deciding whether or not air-supply operations are in order; it has been described here only as a possible last-resort measure.

#### E. Supply by Air Drop

Supply by air drop is another method which should be adopted only in case of dire necessity. This type of operation may be justified when terrain conditions in the target area do not permit the landing of aircraft, either at all or in the scope deemed necessary for successful completion of the mission. This is frequently the case in the early stages of a parachute or airlanding operation, when the airfields designated as later landing areas for the transport units are not yet secured or are still exposed to enemy fire. Under these circumstances, however, supply by air drop has usually been anticipated as a phase of the over-all operation and can be viewed almost as combat employment for the transport forces. Thus, we need not take this particular kind of supply by air drop into consideration here.

During operations to supply an encircled force, supply by air drop may be resorted to if those airfields previously utilized for the landing of transport aircraft should fall into enemy hands. It may, under these conditions, be defensible and justified, despite the reduced rate of effectiveness involved, provided that it is viewed as a temporary solution pending the establishment of alternate landing areas. Supply

by air drop, however, can never be carried on indefinitely.

A third justifiable utilization of the air drop method is in the supply of isolated bases whose strength and geographical extent either do not permit or do not warrant surface supply transport. Apart from these three situations, supply by air drop cannot be expected to be particularly successful; it cannot, for example, be utilized to expedite a ground operation already under way by providing additional supplies. The transport effectiveness thereby attained can hardly be justified in terms of the degree of effort required and the disadvantages inherent in this type of operation.\*

Supply by air drop should be carried out only after careful preparation, not only by the responsible supply agencies<sup>†</sup> but also by the command agencies of the air transport forces. During World War II the air drop missions were regarded as emergency measures to be employed during the critical stage of an airlift undertaking. They were utilized, for example, to assure at least a daily minimum of supply delivery in Russia during the thaw and the subsequent muddy period. Or they were used to provide a force abandoned in encirclement with urgently needed supplies before it surrendered to the enemy. During the last few weeks of the war Germany's Atlantic fortifications, which had been cut off for months, were supplied exclusively by air drop--and this over a distance of hundreds of miles and without any landing facilities for the air transport forces. In retrospect, all this activity seems terribly futile. Other air-drop missions were carried out by night--with varying success--where enemy air superiority or topographical conditions in the target area made a landing impossible.

The commanders of air transport operations are faced with particularly serious difficulties in the case of air-drop actions. In addition to the problems which must be solved in the supply sector there is usually no possibility whatsoever of creating the prerequisites

---

\* Editor's Note: The improvements made in air-drop capabilities since World War II (the 1st and 3d Marine Divisions were successfully supplied by air drop over a two-week period at Choshin Reservoir during the Korean War) would seem to justify more extensive use of this type of operation, although it is still, of course, not as economical as other forms of air supply.

<sup>†</sup> See below, p. 384 ff.

for successful accomplishment in the target area, especially if the course of events dictates a sudden change-over from airlanding operations to supply by air drop. If the mission is to be successful it is absolutely necessary that the marking of supply-drop points and the establishment of approach routes be discussed in detail with the forces utilizing air transport services and with the forces responsible for receiving and transmitting the dropped supplies. As far as the transport crews are concerned, supply-drop areas must be clearly marked in order for them to make their drops accurately. For the troops being supplied, on the other hand, it is imperative that the supply containers be easy to locate, that the drop areas be readily accessible, and that there be some means available by which the supplies can be brought to their final destination; otherwise some of the supplies may be dropped in vain.

During World War II these problems remained unsolved, particularly as they affected night missions. The attempt was made to mark the landing fields, which were always either in the vicinity of the front or inside an encircled area, by means of a special illumination pattern previously agreed upon through radio communication. All too often, though, it was impossible to distinguish the predetermined pattern from the fires originating during combat. Uncertainty about the course of the front line, artillery fire, the smoke developed by fires on the ground, and enemy defensive fire--all of these combined to create such a confusing picture that the transport pilots were frequently unable to identify the prearranged supply-drop areas. The inevitable, albeit understandable result was that the supply containers did not always land inside the target area, but sometimes in the enemy camp. Apart from the daylight missions, which were not always feasible, the air-drop missions flown at dusk were the most successful, since the pilots could utilize both ground orientation and ground illumination signals given as soon as their identity was recognized. It goes without saying that both day and night transport missions must make full use of radio navigational aids in order to protect themselves insofar as possible from deceptive maneuvers on the part of the enemy. During World War II, the enemy discovered prearranged German signals with remarkably little delay, imitated them, and created a good deal of confusion by setting up a multitude of searchlights and ground beacons.

In the future, radio navigational aids will no doubt provide both for a greater degree of security and for a greater degree of

variation in the successful accomplishment of air-drop operations, so that fewer difficulties will be encountered in this field. As far as flight techniques are concerned, this type of employment is very similar to employment with parachute forces. In both cases, however, the same problems will continue to exist, and, for this reason, supply operations by air drop must always be viewed as a type of employment to be ordered only as a last resort.

With the foregoing treatment of the various factors which are of particular significance to the successful accomplishment of air transport actions, the most important lessons inherent in the experience gained by Germany during the many transport actions carried out during World War II have been stated and evaluated. In addition, certain fundamental principles which may be expected to retain some degree of validity for the future have been developed. At the very least, they will be of interest and of value in connection with future developments. The discussion cannot--and does not--claim to have handled all the pertinent questions and problems in detail. This would be quite impossible in view of the extensive scope of the field of air transport, a field whose importance has only recently come to be fully appreciated. An exhaustive examination of all the various kinds of missions in all their possible ramifications would lead much too far afield in the present study. Even so, a good many hints can be gained from the detailed description of the individual airlift operations, hints which can then be evaluated in terms of general developments.

#### Section V: The Structure of the Air Transport Forces

##### A. Organization

The causes for the difficulties faced by the air transport forces in their development were ultimately attributable to poor organization and the weaknesses inherent therein. Many of the lessons of experience derived from unsuccessful operations point, in the last analysis, to the lack of unity, clarity, and consistency in the over-all organizational structure and chain of command. And this lack affected not only internal administrative aspects but made itself adversely felt throughout the entire activity of the air transport forces. In any future establishment of an air transport arm, then, these lessons must be heeded and every possible attempt made to assure that such a force is based on a firmly delineated organizational structure with



an effective and stable chain of command.

In order to achieve this, it is absolutely imperative that three areas of endeavor, with their various ramifications and echelons of command, be firmly united in a single, top-level agency. In the interests of simplicity, we shall call this agency, which is to be in charge of all air transport activity, the "Headquarters, Air Transport Forces." The three functions to be united in such an agency are the following: 1) troop administration (as the highest-level agency for this weapon system), 2) operational command and the issuance of doctrine, and 3) assumption of inspection duty (i. e. the authority and responsibilities of an ordnance inspectorate).

In view of the special status peculiar to an air transport force, it is neither necessary nor desirable to separate these three functions and to assign them to distinct but parallel agencies. The fact that the inspection function is assigned to the agency charged with troop administration and operational command (a fundamental deviation from the practice followed by other armed forces branches) presupposes, of course, exact adherence to the chains of command established. In order to fulfill its inspection function, the Headquarters, Air Transport Forces must remain in direct contact with each and every action in progress; this represents the shortest and quickest way to make certain that the fruits of inspection activity are made readily available to the transport units and to the utilizers of transport services. The fact that the hypothetical Headquarters remains a central agency, neither bound to any one theater of operations nor subject to special assignment to any one aspect of transport activity, provides an absolute guarantee of objectivity in the evaluation of individual missions. Let us examine the organizational aspects of these three functions in somewhat greater detail.

1) Troop Administration. The consistent subordination (as regards troop administration) of all air transport units to a central Headquarters, Air Transport Forces is the best way to assure a firm internal organization in each individual air transport unit. The channels for matters of troop administration, leading from squadron to group to wing to top-level agency, must be clearly defined and must remain unaltered regardless of any temporary changes in operational subordination. (There may, of course, be other intermediate agencies, such as an air commander or an air corps commander; this depends entirely on the over-all size of the air transport forces.) A stable

channel of the type described would assure uniform and prompt handling of such personnel actions as disciplinary matters, administration, unit training, assignments, promotions, and awards. There is no need to discuss each of these individual sectors in detail, since the organization of their activity is the same as in other branches of the military. The point is that each and every air transport unit, regardless of the operational chain of command established for any particular mission, must remain exclusively and constantly subordinate to its "superior headquarters" for all aspects of personnel administration, no matter where this headquarters may be located geographically or operationally. Organizational measures must be taken to make certain that each unit is able to maintain continuous contact with its own superior headquarters, either directly or by utilizing the Headquarters, Air Transport Forces as an intermediate relay station. In this way, the established structure of troop administration channels would remain unaffected by operational needs requiring the temporary assignment of elements from various groups or wings under a single operational command agency.

Within the framework of the proposed organizational system, the Headquarters, Air Transport Forces would also be in charge of training and personnel replacement. Replacement personnel of all categories would no longer be subordinated directly to the individual units but would be assigned by the central headquarters through the replacement units under its command. In this way it would be possible to guide replacement services to all the various units in a uniform and equitable fashion. At the same time, this system would assure that all replacement personnel would enjoy uniform training and would be assigned in accordance with their fitness for the activity involved. This would channel all convalescent personnel, all those returning from leave, and all those temporarily detached to other activities through the replacement units, thus assuring reassignment to their original organizations.\*

In contrast to the extremely unfortunate conditions which prevailed during World War II, the system outlined above would provide a firmly-defined internal organizational structure, a structure capable of fostering morale and esprit de corps and thus of furthering the effectiveness of operational performance.

---

\* See below, pp. 359-361.

2) Operational Command. We have already discussed in some detail (in the section devoted to the conduct of operations) the reasons behind the need for a special chain of command for the air transport forces. This chain of command must be firmly anchored in the structure of the air transport forces. This is all the more important when we consider that operational needs often require the temporary assignment of a part of the air transport forces--and sometimes even a part of a single air transport unit--to a command agency located in another theater of operations, thus interrupting the established "permanent" chain of command. This eliminates the operational command authority of the immediately superior link in the "permanent" chain of command unless this link is specifically invited to participate by the locally assigned special operations staff.

Any limitation of or interference in the freedom of action of a unit commander or squadron leader during the course of an individual air transport mission, without consulting him in advance, is not only undesirable but in most cases quite impossible. Nevertheless, there are certain responsibilities--including the right to issue orders pertaining to all basic operational aspects--which must be preserved at all costs; in other words, they must be made transferrable from the permanent chain of command to the temporary chain of command established for the accomplishment of a particular mission. Moreover, a way must be found to protect the air transport forces against employment requirements based on a fallacious estimation of their potentialities. This particular channel, of course, must lead from the Headquarters, Air Transport Forces (or from the command agencies immediately subordinate thereto) through local operational command agencies to the units themselves.

An organizational structure and chain of command such as the one described above is felt by the author to be an appropriate solution for the many organizational weaknesses observed during World War II. It is fully capable of handling the needs of the air transport forces and, at the same time, of meeting the requirements of the utilizers of air transport services. It takes into account the fact that frequent reassignment of air transport elements is inherent in the nature of the missions they must accomplish, and compensates for it, to some extent at least, by assuring the necessary continuity in matters of troop administration. In addition, it provides a way of meeting changing operational requirements without the latter affecting the internal structure of the units involved.

3) Inspection Responsibilities. The inspection functions assigned to the Headquarters, Air Transport Forces must also be firmly anchored in the organization of the transport forces. These functions are not vertical in direction (i. e. restricted to all echelons of activity in one particular field), but rather are horizontal; in other words, inspection authority for all the various phases of activity represented is approximately on the same level. Inspection authority must be conferred and subsequently recognized by the highest-level armed forces agency, for one of its primary purposes is to contribute to effective coordination with other military branches, units, and headquarters.

The activity of an inspectorate must include the following most important responsibilities:

a) In close coordination with the Chief of Training, the inspectorate is responsible for making certain that the basic training given to flying personnel will also fit them for duty as transport pilots in case of need. In this connection, the inspectorate must determine what modifications or additions to the training program are necessary or desirable, see that they are coordinated with the office of the Chief of Training, and make certain that they are actually put into effect.\*

b) In coordination with the command agencies and training installations of the technical ground organization, the inspectorate is responsible for assuring that the training of ground personnel and the orders and instructions given them will fit them to meet the special demands involved in providing technical ground services for air transport missions. The inspectorate must make certain that the technical units develop and maintain a familiarity with these services and that they are provided with adequate information concerning new developments.†

c) In coordination with the top-level agencies in charge of supply requisition and distribution in all the various armed forces branches, the inspectorate must assure that all lower echelon supply organizations know the roles they must play in air transport and air-supply operations and that all supply personnel will be familiar with the special requirements inherent in joint commitment with the air

---

\* See below, pp. 353-355.

† See below, p. 375 ff.

transport forces.\*

d) By maintaining continuous and close liaison with the various technical agencies, the Headquarters, Air Transport Forces must be in a position to influence the development of all weapons and equipment which might conceivably be of later interest to the air transport forces for their own use. Needless to say, it is also in the best interests of all potential utilizers of air transport services to have the latter exercise appropriate influence over the development of their own equipment at the source. This may properly encompass such matters as the development of transport aircraft, loading equipment, and auxiliary equipment, as well as the design and construction of the goods to be transported (such as weapons, motor vehicles, and instruments).

e) As far as surface transportation services are concerned, the Headquarters, Air Transport Forces must see to it that the surface transportation agencies are aware of those aspects of air transport which must be closely coordinated with their own activities. In addition to rail, highway, and ocean transport, air transport must be firmly established in this field of endeavor as a fourth possibility. Familiarity with the requirements of air transport must be so thoroughly disseminated among all lower-echelon agencies and organizations, and kept so rigorously up to date, that each transportation officer will be capable of independently handling the surface transportation aspects of any air transport mission.

f) Through the inspectorate for training, the Headquarters, Air Transport Forces must exercise its influence on officer training in general and on the training of General Staff officers in the military schools, academies, and ordnance schools. In this way, all officers (whether destined for field or staff service) must be made familiar with the potentialities and limitations of the air transport forces and with the special requirements connected with the employment of the transport forces in air-supply operations. This is, in fact, the only way to make certain that officer personnel will appreciate all aspects of the employment of air transport forces and that this body of information will become a part of the training of all officers in all branches of the armed forces.

---

\* See below, p. 380 ff.

g) Continuous close liaison with the Headquarters, Parachute and Airlanding Forces is so obviously imperative for the Headquarters, Air Transport Forces that there is no need to discuss it in detail here. For operations, each headquarters is wholly dependent upon the other; as a result, close coordination will certainly be established during the period devoted to planning and preparation and carefully maintained thereafter.

As we have seen above, the Headquarters, Air Transport Forces has extremely broad and varied responsibilities as an inspectorate, not only for its own forces but also for all other troops that may someday be involved in air transport operations, either as cargo or as supporting elements. The present study is obviously not the proper place to set up a comprehensive program encompassing all the responsibilities involved. But it is important to emphasize, by pointing out some of the more significant ones, how vitally necessary it is to implant an understanding of the air transport forces and their specialized requirements in the minds of all military personnel, in the thinking of all members of operational command headquarters, and in the consciousness of any and all agencies which might conceivably come into contact with them.

#### B. Internal Structure

The World War II structure of an air transport group, consisting of four squadrons with twelve aircraft each and a staff squadron with five aircraft, was based originally on the operational requirements of the parachute and airlanding forces, which presupposed the joint commitment of the headquarters staff and four companies of one battalion with one complete air transport unit. Inasmuch as combat employment of this type nearly always meant a single, tightly limited action, there was no need to assure the availability of "reserve aircraft." And this group composition was retained for subsequent air transport and air-supply missions. In view of the rather peculiar conditions surrounding the accomplishment of these later air transport actions, it is impossible to point to either positive or negative results which might be used as arguments for or against this kind of organization. If we discount one innovation which proved to be eminently satisfactory (namely, organization into Pulks of five to thirty aircraft for the approach and return flights), the "traditional" composition of squadron and group may be assumed to have proved itself, both organizationally and operationally. As far as troop administration was concerned, the "traditional" composition corresponded, in personnel

strength and in command authority, to that in effect in all branches of the Armed Forces (platoon - company - battalion).

The formal designation of units in the future is entirely irrelevant. The need for camouflage, or any number of other reasons, might well dictate a series of alterations in their official titles. It makes absolutely no difference, for instance, whether a certain unit goes into action as Group III, 1st Special Duty Bomber Wing, as 103d Special Duty Bomber Group, or as Air Transport Group X. The important thing is that a unit be permitted to remain an organizational entity, as regards both internal structure and its position within the over-all organizational structure, and that its status as such remain constant and inviolable.

Under these circumstances the internal esprit de corps of an individual unit, which any responsible commander will do his very best to call into being and to develop, is bound to increase. No matter how competent the commander, however, his efforts in this direction will be wasted if units are continually deactivated and reactivated; a firmly rooted esprit de corps is clearly impossible if this is the case. As a result, ambition, operational readiness, and--ultimately--operational efficiency are bound to suffer. Precisely in air transport operations, the experience gained during World War II clearly indicates that the highest degree of performance was attained from those groups which--out of pure luck or because of the energy and strength of personality of their commanders--managed to retain their identity as separate entities.

If, in the event of war, a systematic and permanent increase in air transport strength is undertaken, it goes without saying that certain organizational changes in the "active" units will become necessary. Ideally, each newly-activated unit should be based on a cadre of experienced crews and highly-qualified technical personnel detached from one of the original units. The immediate result, of course, will be a sharp decrease in the operational readiness of the older group, but in the long run the operational readiness of both units will be established far more quickly than if the new unit had been activated without resorting to the units already in existence. For within a relatively short time the newly created units, 50 percent of each being made up of experienced personnel, will have reached the stage where they can be employed as fully-qualified air transport forces. Needless to say, this is based on the premise that there is

sufficient time available, despite the threat of imminent warfare, in which to carry out such organizational changes.

Once this reorganization of the peacetime units into "mobilization" units has taken place, the sum total of all units (original peacetime forces plus "mobilization" forces) are to be viewed as "active" air transport units and, as such, as an inviolable nucleus for commitment at the front. This status must remain inviolable, regardless of whether the increased operational scope assigned to them remains constant or is rendered temporary by subsequent military developments. All personnel and materiel replacement in future, whether based on new recruitment and production or on existent reserves, must be limited to this nucleus. After each mission these groups must be brought up to their original authorized strength. Conversely, whenever it is necessary to concentrate air transport forces for a particular action, it is these units and their operational command apparatus which must be utilized. Not until their performance capacity has been exhausted should other sources of reserves be brought into play.

These other reserves can be temporarily requisitioned from regular transport operations in order to fulfill the needs of a particular mission. Once a reserve unit has been formed from such sources, the prerogative of deciding on its commitment must remain with the Headquarters, Air Transport Forces. One very effective method of employment is to assign the new unit, one squadron after the other, to relieve an "active" unit bound to a sector of the front by missions which are too routine to make full use of the group's capacities, but too necessary to permit its withdrawal and reassignment to more important operations elsewhere. A gradual assumption of the routine missions by the new unit will free the "active" group for commitment in a more critical area, where the experience and ability of the older crews will soon lead to an increase in operational effectiveness. In this way, too, a good many unnecessary losses can be avoided, losses which an inexperienced reserve force is almost bound to incur if it is utilized right away in a large-scale undertaking whose heightened demands and specialized operational conditions are simply too much for it. The continuation of the routine missions formerly carried out by the "active" group, on the other hand, should cause the reserve unit little or no difficulty.

As soon as the large-scale action comes to an end, the "active" forces should be returned to their original area of operations to resume



their former activity. If it is determined that their losses can be made up from the reserve units--a decision which is up to the Headquarters, Air Transport Forces and the command headquarters involved--then sufficient aircraft and crews from the reserve elements can be reassigned to the "active" units to bring the latter back up to their authorized strength. The rest of the reserves are either distributed to other groups as replacements or released for assignment elsewhere. The method described above has the advantage of assuring that everything possible is done to bring the new reserves, who are given the opportunity to acquire operational experience gradually, up to the average performance of the "active" units as rapidly as possible.

A firm and purposeful organization of the entire air transport arm will in turn guarantee that all those extant forces which can be utilized for air transport activity are properly organized and administered and that all air transport operations are carried out as economically, as effectively, and as successfully, as possible.

#### Section VI: Technical Services

In almost all of the reports dealing with the accomplishment of airlift undertakings, the question of technical ground services fills a gloomy chapter, fraught with difficulties. The inadequacies in this field presented operational planners with problems which were all but insoluble. Therefore it is particularly important that we learn from past experience how to avoid the fundamental mistakes which resulted in inadequacy, or at least that we learn how to integrate flying and technical service units in such a way as to mitigate the absolute dependence of the former on the latter.

If we draw the proper conclusions from our evaluation of past air transport operations, we have no choice but to insist that the technical service element of an air transport unit be inseparably coupled with the flying element. No matter where the unit--or a part of the unit--may land, and no matter how little previous preparation it may have had for a given mission, it must be assured of adequate technical services provided by its own maintenance element without outside assistance. From squadron level upwards, each and every unit assigned to operations from an emergency airfield, for example, must be in a position to maintain its operational readiness without having to rely on help from any other organization.

An air transport squadron should be able to achieve technological self-sufficiency more easily than any other kind of air unit, by dint of a well conceived organizational structure and a carefully selected roster of equipment. The personnel composition of the squadron must be worked out with great care and attention to detail, under consideration of operational, technological, and administrative aspects. The missions of flight, technical, and administrative personnel must be so closely coordinated in each field of activity, and the personnel themselves so many-sided in their capabilities that they complement each other exactly, thus assuring that the unit will possess optimum strength, not one man too few and not one man too many, for its operational missions and for its internal administrative needs.

The unit's equipment must be free of ballast of any kind, yet it must include all those items which are indispensable to the maintenance of operational readiness. It must be left to the ingenuity of the aeronautical engineers to design and construct appropriate multipurpose equipment capable of fulfilling as many as possible of the technological tasks to be done. In view of the advances of modern technology, there need hardly be any limitations of a technical nature imposed upon the development and production of such equipment. There would seem to be no reason, for example, why it should not be possible to construct such items as relatively small motor vehicles, trailers, caterpillar tractors, jacking devices, lubrication trucks, scaffold towers and cranes, which are simple and easy to handle and yet perfectly adequate to their purpose. Of course, their dimensions must not exceed the limits imposed by the cargo space of the transport aircraft, for they must remain a part of the store of instruments and equipment which is transported with the squadron by air into the operational area. There are other items, too, which must be considered part of this basic materiel: field equipment (tents, folding cots, collapsible tables and chairs, office and kitchen equipment), signal communications equipment, loading equipment, in short everything which the squadron will need to keep itself fully operable entirely on its own.

The development of simple but fully adequate instruments and equipment of the kind described above would be a boon not only to the air transport forces but to all other air units. For all air force units are sometimes subject to sudden reassignment from one area of operations to another and, in view of the tremendous distances sometimes involved, it is clear that movement of their technical service

components by surface transport would involve lengthy and operationally costly delay. If the components can be transported by air, however, they can be placed at the immediate disposal of the flying units and no time will be lost in developing a high level of operational readiness.

As regards the question of air transport for all technical and administrative personnel together with all the equipment, there is one criterion which must be applied--the necessity of reserving all cargo space during the transfer flight into the new operational area for personnel and materiel which are urgently needed for the effective functioning of the air transport unit being transferred. No matter how critical the situation in the new area may be, the air transport unit cannot afford to ignore this criterion. Any postponement of the movement of its own urgently needed supporting personnel and materiel is bound, in the long run, to jeopardize its operational readiness and thus its potential effectiveness. From the point of view of ultimate success this single failure to utilize the cargo space for the transport of supplies needed by the combat force at the target area will be compensated many times over during the course of the operation by the increased efficiency to be gained from a consistently high standard of operational capability. In this particular regard, the air transport forces enjoy rather a special status, which perhaps can be best illustrated by the following example. Let us assume that an armored column must cross a bridge in order to reach its area of operations and that this bridge is not stable enough to bear the weight of armored vehicles; the only possible solution is to strengthen the bridge, for without the armored column, the entire operation is utterly impossible. Exactly the same situation obtains in the case of an airlift operation!

In concluding this section on ground services, mention should be made of the advisability of establishing a central aircraft depot under the direct supervision of the Headquarters, Air Transport Forces. This depot would be responsible for filling requests from all of the various air transport units and, thanks to its centralized jurisdiction, would be able to guide equipment distribution to a certain extent. A centralized depot such as this is particularly desirable if the secondary equipment of the units (i. e. equipment other than aircraft) is subject to frequent change, for all new equipment, instruments, and spare parts would automatically be delivered to the central depot for processing and distribution. In this way, the individual groups would be relieved not only of a good deal of time-consuming work but also of the necessity of maintaining separate stores of equipment--and

experience has shown that these stores always turn out to be either superfluous or inadequate. Looking back over the air transport missions of the last war, for example, one can see how ridiculous it would have been to burden each group with complete sets of equipment for the tropics, for survival at sea, for parachute actions, and for winter operations in Russia. On the other hand, it would have been just as bad to have this equipment stored somewhere in a general Luftwaffe supply depot, for this would certainly have decreased the chances of its being made available immediately in the event of a large-scale operation requiring it. Issuance and distribution must be under the supervision of a single, central agency capable of regulating them in accordance with over-all planning or with priority of need.

The foregoing pages will have made it clear that an air transport force has no choice but to occupy itself intensively with the field of technical services. Firm integration of technical service elements into the organizational structure of the air transport units provides the best guarantee that every effort has been made to assure the highest possible degree of performance in this extremely important aspect of operations, an aspect which is of no less significance to the utilizers of air transport services than to the air transport units themselves.

#### Section VII: Training and Personnel Replacement in the Air Transport Forces

In peacetime and during the early years of World War II, the crews for the air transport units were selected by the office of the Chief of Training from among the personnel who had completed thorough basic training. All the pilots coming from this source could be safely presumed to be fully familiar with multi-engine aircraft and to possess better-than-average mastery of instrument flight techniques. Their basic training had included intensive practice in take-offs and landings, in cross-country flying, and in bad-weather flying, and represented, in short, a fully adequate foundation on which to base further training in the techniques required of a transport pilot.

This advanced training was carried out within the air transport units, which at that time were subordinate to the Headquarters, Parachute and Airlanding Forces. As has already been pointed out, joint commitment with the latter was considered to be the primary mission of an air transport arm. In a firmly outlined program of training providing for a gradual increase in difficulty, the crews were carefully

and systematically prepared for their future tasks. Their basic training was augmented by intensive practice in formation flying, in hovering to drop parachutists, and in low-altitude flight (both singly and in groups). These techniques were practiced first alone and then in joint exercises with the parachute and airlanding units. Each pilot's mastery of general flight techniques was constantly refreshed by means of supplemental courses in instrument flying and navigation. Commitment with the parachute and airlanding forces required a high average standard of training among the air transport crews, for any weakness in this respect would have a detrimental effect on the total striking power of the landing forces. The training program was subjected to continual re-evaluation in terms of tactical requirements, so that any additions or modifications which might be deemed necessary could be accomplished without difficulty.

The tragically low level of capability demonstrated by the Luftwaffe forces employed in the Ardennes offensive in December 1944, a deficiency which was not the fault of the crews themselves but of the inadequate training program, epitomizes the last stage in the decline of the program of integrating younger crews into existing units, which originally had been so effective.

In wartime, obviously, the basic training given at the Luftwaffe flight schools could not be so complete or so thorough as during peacetime, since the demand for pilots for all Luftwaffe branches soon outstripped the supply. The fact that the aircraft model selected for the transport forces (the Ju-52) was, at the same time, the standard training aircraft in the schools--a circumstance which ought to have been favorable for the air transport forces--was in reality a source of disaster for them. In the absence of a central air transport headquarters which might have contradicted them, Luftwaffe leaders gave credence to the theory that any pilot who had completed flight training was automatically ready for employment with an air transport unit. As a result, the transport units drew their replacement personnel directly from the schools right in the midst of the most difficult and dangerous missions. Or--an even more reprehensible practice--the crews coming fresh from the schools were utilized to form a new unit, which was placed under the command of an officer who was usually nearly as innocent of experience as his charges.

Many of these young pilots were simply not up to the demands made upon them. How could they be released by their instructors one

day and be expected to take off from an ice-covered runway with an overloaded aircraft for a flight over enemy-held territory the next? They were expected to know how to bypass enemy positions in low-altitude flight, how to utilize hillocks and sparse wooded stretches for cover against enemy artillery fire, and how to land on a narrow strip without crashing into bomb craters or aircraft wreckage. They were expected, further, to unload their aircraft in the face of enemy bombing or strafing attacks, to reload it with wounded personnel, and to make their way back to their take-off bases.

Even when squadron captains or group commanders were aware of the necessity of giving the new pilots at least a brief outline of what they were to do, their time was too fully occupied with the countless details involved in preparing for the operation; after all, the goal of these operations was of paramount importance--the maintenance of the fighting force. As a result, the flights over enemy territory, in the face of continuous artillery fire, became an irresponsible substitute for "combat training." Needless to say, this situation was responsible for a considerable percentage of personnel and materiel losses. A minimum period of intermediate training would have involved a short delay in the assignment of replacements, to be sure, but it would have reduced the chances of personnel losses and would thus have increased the ultimate capacity of the gaining unit for a longer period. This intermediate training period, as preparation for assignment to duty at the front, could have been a logical extension and intensification of the basic training given in the schools.

In the future, the units at the front should never be burdened with the combat training of the replacement forces sent to them. The only proper solution is the organization of a centrally administered replacement training program to serve as a bridge between the basic training received in the flight schools and the actual demands to be met at the front, so that the replacement crews may be familiar with what is awaiting them and thus immediately capable of full employment.

During peacetime, the equipment and personnel strength of an air transport arm will always be determined by the strength limitations imposed on the over-all armed force of the nation concerned. Furthermore, if the principles of employment already discussed are strictly applied, there should be relatively little for an air transport force to do in time of peace, apart from its routine training activity and participation in practice maneuvers. The conventional methods

of transport will presumably be capable of accomplishing whatever mission may arise by surface transportation. Only very rarely should it be imperative that personnel or urgently required supplies be transported by air.

It follows that an expansion of air transport missions and, with it, a corresponding increase in air transport strength can take place only within the framework of plans and preparations for involvement in hostilities. The degree of expansion necessary for the strategic and tactical air forces is determined by the planners' knowledge and evaluation of the strength of the potential adversary. The armament program is established on the basis of industrial capacity, the reserve stocks on hand, and the planners' conception of the military force which must be mobilized in order to gain the upper hand over the enemy. During the course of the war, then, a relatively stable trend usually develops; either the striking power of the air units continues to increase, or losses and replacements balance each other, or the striking power of the air units declines steadily in the face of increasing enemy strength. Any one of these trends can be expected to last for some time; furthermore, each brings with it a more or less predictable train of developments.

The situation is vastly different for an air transport force. In the first place, prior to the actual outbreak of hostilities there are no criteria by which to measure the adequacy of air transport strength. During the course of a war, this strength is in any case only relative. There is absolutely no way to tell in advance whether or not there may be a sudden need for a far larger air transport force for commitment in a single, short operation. So long as air transport leaders are free to decide whether or not they can risk participating in such an action, there is no harm done. If they have no choice in the matter, however, as when the operation is or can be of great significance for the outcome of the war, then every attempt must be made to requisition every single aircraft and pilot available. An undertaking of this kind need not be termed a "stopgap measure" or a "last resort," as was nearly always the case with the airlift operations during the war. On the contrary, it may represent a unique opportunity whose successful exploitation is worth any amount of risk. The scope of such an undertaking will certainly exceed the capabilities of the available air transport units. Under these conditions, all aircraft and crews from training units, replacement units, courier stations, special staffs, liaison squadrons, and any other sources must be rounded up to meet this

one-time demand for increased strength. Even units from other air force branches can be borrowed for an operation of this sort and, as experience has shown, with great success. The possibility of bolstering his strength with borrowed forces must always remain open to the air transport commander; he may take recourse to it, however, only if the objective to be gained is truly of decisive importance. If he is convinced that this is the case, he need not hesitate to act.

It would be idiotic to set up and maintain an active air transport force of such dimensions that it could meet top strength requirements alone, without recourse to the various sources of reserve forces. Apart from the few instances in which tremendous strength is required over a short period of time, the majority of such a force would be idle most of the time, for once a large-scale operation has been concluded the need for air transport space reverts to normal or even sinks below normal.

Nevertheless, it must be emphasized that the method of carrying out a large-scale operation described above is fraught with considerable peril. If the planners are aware of the dangers, and if the undertaking proceeds as planned, there is no reason why these dangers cannot be averted. One pitfall must be avoided at all costs; planners must not succumb to the temptation to exploit arbitrarily all the available reserves, either in the initial stages of the operation or later on as the climax nears. For ill-considered employment can often do more harm than good. There is little to be gained from employing aircraft which are not fully suited to transport missions. Also, it should be remembered that the borrowed crews, totally unfamiliar with the conduct of air transport missions, may not be able to keep up with the rest. Their lack of confidence and their inexperience will surely combine to make them most vulnerable to loss, so that it may be a starkly decimated force which returns to its original missions or is integrated into the permanent air transport units. A way must be found to reduce the risk involved, so that the practice of borrowing reserves may still be kept open to the air transport commander.

It is one of the primary tasks of a central Headquarters, Air Transport Forces to deal with the problem of reserves or replacement forces in such a way that a mutually satisfactory solution may be found. Training and replacement administration for the active air transport forces must be brought firmly under the control of a single central agency; at the same time, all the potential reserves must be



tabulated and must be taken into account in any planning activity, regardless of whether or not they will ever be utilized.

In this connection, it must be pointed out that every single aircraft crew might at some time in its career be used in air transport operations. On the other hand, one cannot require each pilot, in addition to his training as bomber, fighter, or reconnaissance pilot, to take a special course in the flying of air transport missions (although such a course ought to be mandatory if the pilot is really going to be used in that way). A special brief training session either before or during the large-scale operation is probably not feasible under the hectic conditions usually obtaining. The only way to make sure that the entire potential reserve (including every crew within the air force) is sufficiently familiar with the requirements of air transport actions to function effectively is to incorporate such training into the basic flight course given by the air force schools. The most important aspects can easily be introduced into the training program and if they are carefully integrated into the curriculum, the training period need not be lengthened at all. This plan would not only stand the air transport forces in good stead but would be of use to the entire air force. It represents an instance of preventive maintenance in the best sense, for it would guard all air units against unnecessary losses when they are employed in operations for which they have not been specifically trained.

In close coordination with the agencies in charge of the training function and the agencies having inspection authority over the various air force branches, the Headquarters, Air Transport Forces must set up a schedule for the basic flight training program which will cover the needs of the air transport forces by the following:

- a) flight training in both single-engine and multi-engine piston-driven aircraft,
- b) take-off and landing practice made increasingly more difficult by shifting runway markers,
- c) combining cross-country and navigation practice flights with intermediate landings at strange airports and landing fields with more difficult terrain conditions than the home airfield,
- d) assuring that the majority of training is related to the most

common types of transport aircraft (to be placed at each school's disposal in turn),

e) training in night flying, to include the points listed under "a" through "d" above;

f) training in instrument flight, to be continued until the student is able to handle several aircraft types in rough weather, including making simple landings;

g) practice flights with loaded aircraft (the load depending upon the stage of proficiency of the student) in order to familiarize the student with the flight characteristics of a loaded transport aircraft, and

h) practice flights in loaded aircraft (load dependent upon stage of training reached) with one engine out of commission.

A basic training program which includes the points outlined above provides the best assurance that each and every pilot--regardless of what type of unit he is assigned to and what type of specialized training he is given later on--can be employed in air transport operations if the need should arise. The result, of course, is an almost endless source of reserves for the air transport forces. Once the basic training period is over, however, it is hardly likely that pilots assigned to other air force branches will have an opportunity to advance their knowledge of air transport matters or even to keep in practice in what they have already learned. This situation can be remedied somewhat by issuing to all pilot personnel periodic "memoranda" containing information on significant innovations, changes, and developments in the air transport field. In this way, the potential reserve can at least keep its theoretical knowledge up to date, which may be of very great value in the event of an operation requiring its services.

#### Section VIII: Specialized Training Within the Air Transport Forces

##### A. Basic Training

Those crews who are assigned permanently to the air transport forces, either directly after completion of basic training or by later reassignment from some other branch, must be given specialized

training in the particular flight techniques needed for the accomplishment of air transport missions. A central air transport pilot replacement unit, and not the operating air transport units (except in the most dire of emergencies), must be given the responsibility of training, which should cover the following techniques:

1) Formation flying, beginning with the aircraft taking off singly and assembling in the air, progressing to take-off in ever more rapid succession; formation flight in groups of three or five aircraft, or in full squadron formation; dispersing and reassembling quickly in the air (to dissipate enemy ground fire, and to mass their fire power against enemy fighter attack, respectively); intensive practice in approaching for landing, the aircraft peeling off from the formation in various positions as ordered.

2) Low-altitude flying, with single aircraft and then in formation, over terrain of varying difficulty but providing opportunity for cover; (during these flights, unit leaders and observers should be given training in orientation by landmark, in approaching control points at designated time intervals, and in locating designated supply-drop points).

3) Landing techniques, to be discussed with the crews with the aid of charts and models and to cover preparations for a landing, maintaining position during the approach, taxiing to the edge of the field and into position for unloading, taxiing into take-off position, what to do in case of unforeseen complications; practice in landing singly, in series of three or five aircraft, and in series of squadron or group strength, on strange fields as well as at the home field, under conditions of progressively greater difficulty. The conditions simulated should become more and more realistic as the students become more proficient.

4) Forced landings, with appropriate aircraft types, should be practiced assiduously to give the pilot a feeling of absolute mastery over his aircraft and increased confidence in his own ability (as experience has shown, this type of exercise often proved extremely valuable to pilots faced with real forced landings later on).

5) Night flying in formation, to be perfected to the point where pilots are capable of carrying out air transport operations at dusk and at dawn, as well as during moonlit nights.

6) Instrument flying must be perfected to the point where all pilots are capable of a) close formation flight during bad weather, acting as lead pilot if necessary, and b) line formation flight (each aircraft following closely behind the other) during bad weather.

7) Paratrooper release flights, in formation, with fully-laden aircraft, involving the following: a) approach flight to the drop area via specifically designated control points, taking into account velocity and direction of surface winds, b) climb to proper drop altitude, c) cutting engine to hovering speed for the drop, d) maintaining drop altitude at low speed while load becomes lighter (paratroopers being released), and e) return flight at low altitude. All of these phases should be practiced under conditions of varying difficulty, such as releasing the paratroopers with, against, or across surface winds, varied visibility (dawn, dusk, night), and take-offs with little or no previous preparations.

This particular stage of training can very profitably be closely coordinated with the training program followed by the parachute forces; each side will derive valuable benefits from joint practice maneuvers. The degree of operational readiness of the transport forces for combat employment with airlanding units can be kept at a high level by periodic temporary assignment of transport units to take part in parachute and airlanding practice.

8) Supply-drop techniques can be taught in conjunction with almost any type of practice flight, during which weapons and supply containers are dropped from various altitudes at a predetermined area. In order to assure perfect mastery of the techniques involved it is wise to include such practice in the training program from the very beginning (to make the missions more realistic, real loads--consisting of weapons and equipment no longer usable at the front--should be utilized whenever possible). Needless to say, this phase of training should make use of any modern advances in the field of load release mechanisms.

9) Glider-tow techniques constitute a highly specialized field of training for the air transport pilot. Whether or not such training is appropriate would depend upon whether there is any chance that freight gliders may be employed and, if so, with what type of air transport unit. Glider-tow training can certainly not be made a required phase of the curriculum, although some familiarity in this

field would nicely round off a transport pilot's training. Theoretically, then, some training also ought to be given in the techniques of picking up a glider from the ground while in flight.

Pilots who have completed the course in training outlined above may be considered fully qualified for assignment to an air transport unit. It goes without saying that the training of airborne observers, radiomen, mechanics, and gunners must also be integrated into the various practice flights, while their professional courses must also be slanted towards their participation in air transport operations. As a matter of principle, it can be assumed, at least during peacetime, that each pilot will be employed exclusively in one of the two types of operations (that is, combat employment or pure air transport duty), and from this point of view it may seem superfluous to train all pilots for both types of commitment. Nevertheless, this complete training is desirable, for in the midst of operations it is usually impossible to keep the two kinds of employment separate and distinct. And under front conditions and pressure of time, it would be immeasurably more difficult to have to begin supplemental training. In no case would such training be comparable to the well-founded theoretical and practical courses possible in peacetime. There can be no doubt but that the weakness traceable to the sketchy and hectic training programs of World War II was responsible for a great deal of unnecessary bloodshed. The end effect was a sharp reduction in the performance capacity of the air transport units owing to the tremendous losses of personnel and aircraft.

#### B. Advance Training

During peacetime it is quite possible for the active air transport units to assume responsibility for specialized advanced training, thus obviating the need for special training units. Within the framework of the development and expansion of the air transport arm it may prove advantageous to vary the training programs carried on by the individual groups. In this way, while one group is specializing in training for combat employment, a second group can be concentrating on training for air transport and air-supply missions. The advantage, of course, lies in the earlier availability of forces capable of full commitment in both fields. This is a question which must be decided at command level, however, inasmuch as training requirements may not be permitted to interfere in over-all operational planning.

Once all the air transport crews have attained a satisfactory average level of proficiency, there remains only the problem of keeping them in practice and of training any newly assigned personnel. Periodic joint maneuvers with supply units and with a potential receiver of air-supply services will test the general level of operational readiness within the air transport units.

In the event of war the active air transport units must be relieved at once of all responsibility for training. The only "educational" function left to them should be the dissemination of reports on the experience gained during operations.

If any additional units are organized from the reserve forces, or if individual crews are reassigned from the reserves to the permanent air transport forces, their level of performance must first be brought up to the standard achieved by the active units. Accordingly, the Headquarters, Air Transport Forces will need some sort of training department to meet its internal needs. It would be superfluous and impractical to set up a special "air transport school," for the necessary courses can be easily and effectively incorporated into the program of the replacement units, which must be established in any case to serve as a central issuing agency for replacement personnel and materiel to all air transport elements.

The replacement organization should have as its nucleus an air transport group under the command of a highly qualified, experienced officer, who himself is directly subordinate to the Headquarters, Air Transport Forces. Attached to the central group should be replacement units covering all the various aspects of air transport activity, including ground services. The tasks assigned to the replacement organization would be varied and complex. The organization would be responsible for training not only newly-assigned pilot personnel, but also all of the reserve technical service personnel.

The roster of activities for the central unit would include the holding of courses for unit commanders and deputy commanders, to which personnel from the units in the field should be detached whenever they can be spared from front duty. The replacement organization should also serve as a redistribution point, assembling men who have recovered from wounds or illness and men returning from leave and funneling them back to their old units. All aircraft returning to the front from the home area should be ordered to proceed via the

replacement center airfield or, if this would mean a costly detour, to report to the replacement center by telephone, so that any extra air space may be utilized. The replacement of aircraft, the issuance of technical equipment, and the distribution of all materiel should all be processed through the replacement center, so that these activities may be accomplished in accordance with the best interests of the units at the front. The just and efficient handling of the replacement function under the firm supervision of the highest command agency would be most advantageous to the entire air transport force, all the way down to its smallest unit.

The replacement organization would also serve as a channel through which the Headquarters, Air Transport Forces could regulate the distribution of replacements to the units at the front in full accordance with the exigencies of the operations in progress. The training of replacement forces could be systematically furthered and guided into those fields most in demand at any given time, a thing which can be achieved only by a central agency able to survey the entire field of air transport operations.

It is not enough for a replacement organization merely to bring its operational units up to authorized strength; the replacement forces assigned to each unit must be trained in the missions they will face, and their standard of training must be approximately that of the unit to which they are assigned. When there is plenty of time available for training, i. e., when the demand for replacement personnel is not too hectic, then it is desirable to try at least to prepare the crews for employment in all types of transport operations. If, however, one particular type of commitment is emphasized in front operations over a long period of time (which, of course, automatically leads to a critical situation as far as replacement forces are concerned), there is little hope of keeping more than a few groups "pure," i. e., specialists in their fields. If, for example, training in combat employment (joint commitment with parachute and airlanding forces) can be given to only a few of the replacement personnel over a period of time, obviously steps must be taken to assure that all these personnel are actually assigned to groups reserved for employment with airlanding forces. During the last years of World War II, only a small percentage of crews, out of all the air transport units, were capable of dropping parachute forces, a situation for which only the lack of a centrally organized replacement system could be blamed. As an example, those crews who had been trained for combat employment had been so

widely scattered by the continual reorganization of the original "pure" groups that there was no way--short of mass reorganization--to get together a large enough unit to transport a parachute force to the Ardennes. It can be assumed that the parachute and airlanding forces will quite properly do everything in their power to convince the Headquarters, Air Transport Forces that such a situation must never occur again. And there is no reason why it should happen again, so long as the training program and personnel replacement system are carefully organized and firmly administered.

Before leaving the subject of training and replacement programs in an air transport force, one other point should be emphasized, namely, that the replacement organization itself must never under any circumstances be assigned to the front, either as a whole or in part. This unit must remain inviolable, even if the demand for air transport space at the front should attain the proportions of a full-scale crisis. This principle must be clearly understood and accepted by all command headquarters, all supply agencies, and all potential users of air transport services. For in the last analysis, it is in the best interests of all of these to preserve a healthy foundation of sufficient scope to assure that the air transport forces will be able to meet the demands made upon them, not only during a short-term action but over as long a period as their services are needed.

#### Section IX: Transport Aircraft

##### A. General

Almost all of the missions assigned to Germany's air transport forces were carried out in the Ju-52. This model had come to be the standard aircraft for German commercial air traffic and, as such, had proved eminently satisfactory. It began its role in military aviation as an auxiliary bomber and was soon switched over to air transport operations. As a result, it was not the air transport forces which established the requirements to be met in designing and constructing a suitable transport aircraft but the transport aircraft which prescribed the limitations within which the air transport force might grow and develop.

The dropping of parachute forces, the transport of airlanding units, simple freight transport over short and long distance, over-water transports, winter operations in the snows of Russia, summer



operations in the deserts of Africa, and, last but not least, a long series of air-supply actions to surrounded troop elements--despite their inherent variety, all of these operations were carried out by one and the same aircraft model. The logical conclusion is that the Ju-52 must have been such a versatile plane that it was ideal for employment as a military transport aircraft. And this is quite true when we consider its outstanding flight characteristics, its relative simplicity of design, its invulnerability to weather conditions, and its almost legendary robustness. For these alone are the qualities which enabled Germany's air transport force to accomplish such a variety of operations during World War II and to raise the importance of air transport to the height it occupied by the end of the war. On the other hand, the Ju-52, by virtue of its comparatively limited loading capacity and the arrangement of its loading space, did impose certain limitations which were never overcome, although the urgent need for additional space was demonstrated again and again. A number of plans and designs made during the war indicate clearly that this need was recognized, as does the parallel developmental work carried on in connection with the freight glider. In an effort to meet this need, air transport commanders sometimes resorted to certain planes in use with the bomber forces for transport missions carried out under special conditions.

Demands for a new and better transport plane were completely ignored, however, until the aircraft industry had been reduced to such straits that it was no longer capable of bringing a new model through the stages of design, development, and production to the units at the front. Several of the designs show that Germany's engineers were on the right track, and although the models in progress still had some technical defects and were far from ready for employment--or even testing--at the front, they can profitably be taken into consideration, along with the lessons of experience in the field, in any deliberations concerned with equipping a future air transport arm.

Today, technology has reached the point at which it has hardly any limitations to impose upon the construction of an ideal transport aircraft. Size, speed, payload, armament, instrumentation, flight characteristics, basic construction--all of these factors can now be adapted without difficulty to the exigencies of the various kinds of air transport activity. In order to establish roughly the special demands made by each type of employment, the most important requirements for each type will be broken down into take-off and landing, loading

capacity, loading and unloading, flight characteristics, defensive armament, and technical maintenance.

### B. Combat Employment

1) Performance. There are several definite requirements to be emphasized in connection with the dropping of parachute forces. The transport aircraft must be so constructed that the pilot can cut his engines to hovering speed within an extremely short time. The general flight characteristics must not be permitted to suffer in fulfilling the demand that the aircraft perform effectively with a full load and in close formation flight. Moreover, the machine must be so robustly balanced that it can weather the sudden "buoyancy" which occurs when paratroopers are released or supply containers dropped. The maximum low speed must be lower than the highest speed at which paratroopers can be safely released.

The performance requirements to be fulfilled during the landing of an airlanding force are the same as those which must be met during an air-supply operation, since the conditions are approximately the same.

2) Size. As far as the size of the transport aircraft is concerned, the most important criterion is the fact that the paratroopers and all their gear must be dropped with the greatest possible exactitude into a tightly limited area. It is unlikely that a heavy transport aircraft could fulfill these requirements, although it is conceivable that a parachute unit might be distributed among a number of heavy transport aircraft, which would then release their paratrooper loads next to one another at exactly the same time. This method is not to be recommended, however, for it harbors too many sources for errors which could jeopardize the outcome of the entire operation.

Light transport aircraft with a capacity of ten to fifteen men are quite acceptable for combat employment, despite the fact that they impose a definite limit on the weapons and equipment which can be transported. Medium transport aircraft with a capacity of twenty to thirty men are even better suited. It should be remembered, though, that aircraft of this size should have two release bays. Heavy transport aircraft, however, are unsuited for joint operations with parachute forces, at least during the first attack wave, no matter what degree of air superiority may obtain.

The problem of dropping weapons and other supplies which are urgently needed by a landed parachute or airlanding force should be capable of solution without any particular technological difficulty. The development of modern technology will certainly provide release racks for all the various kinds of supply containers, as well as release mechanisms which function either internally, from the loading area, or externally, from suspended release racks.

3) Loading. It is unlikely that the loading of transport aircraft at their take-off bases will make any demands beyond those which can be met by the technological equipment normally present. Any problems to be solved in this respect will be organizational ones, requiring exact planning, firmly-established chains of command, clear identification of aircraft, definite determination of the airfields to be used for storage and loading, close coordination between parachute and airlanding force commanders and the commander of the air transport units, the preparation of and adherence to exact time schedules, and the maintenance of absolute discipline on the part of all concerned. In general, the requirements to be fulfilled in connection with the loading and unloading of transport aircraft in combat employment are basically the same as those to be met in connection with transport missions.

4) Flight Characteristics. Apart from the requirements which have already been discussed in connection with the releasing of parachute forces, there are no particular demands to be made upon the flight characteristics of an ideal transport aircraft. Such factors, for instance, as climbing performance, cruising speed, and maximum speed are unimportant as far as combat employment is concerned. It is assumed that all the models under consideration are capable of low-altitude flight and of close-formation flight.

5) Armament. The strength of a transport plane's defensive armament is relevant only when the aircraft are operating in a small group or when they are engaged in surprise missions, without benefit of previous preparation or support from tactical air units. Within the framework of large-scale parachute or airlanding operations, arrangements will always be made to protect the participating air transport forces during their approach and return flights as well as during the time they must remain over the target area, such arrangements to consist of the simultaneous assignment of fighter and close-support air units as supporting forces.

### C. Air-Supply Missions

1) Take-off and Landing. The take-off from the base of operations presents no particular problems for the transport aircraft. If they can dispense with long runways and concrete surfacing and if they are capable of climbing well when loaded to capacity, it will facilitate the choice of take-off bases and consequently extend the potential scope of the entire air-supply operation. The use of take-off aids (thrust augmenters) may also be advantageous. In any case, this equipment should be readily available at the airfield. Ideally, the transport aircraft should have enough reserve power to enable them to take off again successfully from the short runways which may be encountered in the target area. If the runways are adequate, then the reserve power can be utilized to carry a heavier load, such as wounded personnel or unserviceable equipment.

As far as landing operations are concerned, the most important requirement to be met by a transport aircraft is that it be capable of landing on an open field and of taking off again under its own power. Even here, there are certain minimum conditions which must be fulfilled: the ground must be fairly firm and solid, the landing strip must be sufficiently long and wide, and the obstacles along the approach and departure lanes must not be too high. The landing gear should be robust (ideally, capable of negotiating rough terrain), with broad-surfaced oversized wheels to keep the heavily laden aircraft from sinking into the soft ground. The wheels should roll easily and be fitted with a steering mechanism. Landing aids must be developed to permit the transport aircraft to take advantage of extremely short landing strips; some possibilities include braking propellers, brake flaps, and tail parachutes.

2) The Cargo Space and the Size and Weight of the Cargo. These will always remain important factors in determining the scope and effectiveness of an air transport operation. Ideally, of course, these three aspects of the problem should be coordinated while both aircraft and goods are still in process of design. If this is no longer possible, and the transport aircraft (as well as the weapons and other items to be transported) must be accepted as is, the scope of an air-supply mission is necessarily determined by whether the supplies to be transported will fit into the cargo space and, if so, how many units can be carried. It is one of the most responsible tasks in the entire field of air transport to establish a "loading category" for each and

every item which might conceivably have to be transported by air, such classification based on the dimensions of the cargo area and the maximum allowable payload for all the various types of transport aircraft.

In the over-all construction of the aircraft, it is important that provision be made not only for the largest possible payload but also for the largest possible dimensions, so that objects which may not be particularly heavy but which are of awkward size and shape can also be transported.

It is also important to determine which aircraft model is best qualified to carry out air-supply missions effectively and economically. The advantages inherent in one model, of course, can never compensate fully for the disadvantages of a second model without the first model's having other disadvantages of its own. In connection with air-supply operations in particular, it is important that we distinguish between three basic aircraft types.

#### Light Transport Aircraft

These are suitable for short supply runs, or even for small-scale air-supply operations, in which the supplies are delivered directly to the recipients, either by landing or by supply drop. The requirements already discussed in conjunction with take-off and landing performance can be met with relative ease by light aircraft. They are extremely maneuverable and can be employed in groups of two, three, or five aircraft as well as in squadron strength, utilizing a number of different landing fields or supply-drop points within the same target zone. Other advantages are the following: reduced risk in the event of successful enemy attack; minimum waste in the accomplishment of small but urgent missions, where the cargo involved is far less than the maximum payload; and the relative ease and speed with which they can be loaded and unloaded. One serious disadvantage, of course, is the near impossibility of transporting goods of large size or awkward shape, for if such items can be transported at all, then they can only be transported in very limited number.

#### Medium Transport Aircraft

The main advantage of this type lies in its relatively large loading area. In addition, if the aircraft is properly designed, its size permits the incorporation of a number of features which do much

to facilitate loading and unloading operations (such as double tail booms, high-wing construction with low-slung body, and conversion of the rear wall of the storage area into a loading ramp). The extremely favorable ratio of payload to flight characteristics makes the medium transport aircraft ideally suited not only for air-supply operations but also for almost all air transport missions. Germany's experience in the last war clearly reflected the urgent need for a medium transport aircraft. Despite promising beginnings (the Go-244), development never progressed to fruition.

#### Heavy Transport Aircraft

At first glance, one would think that this type would be best suited for all types of supply missions, at least from the point of view of the users of air transport services. Roughly estimated, a squadron of heavy transport aircraft would be capable of delivering the same volume of supplies as one or two groups of aircraft with the capacity of a Ju-52. At the same time, however, it is a matter of principle that air-supply missions be carried out economically in terms of exploitation of the enemy situation and of terrain characteristics. And this, of course, places some very definite restrictions upon the employment of heavy transport aircraft.

These giants can be employed in combat only after a certain period of preparation and under very specialized conditions, and both of these factors are apt to occur least of all within the framework of air-supply operations. If they should occur, contrary to all expectation, the resulting operation would have more the character of a pure air transport action; only a short stretch over enemy-held territory would have anything in common with an air-supply mission.

The following conditions must be considered mandatory if heavy transport aircraft are to be utilized in air-supply missions:

a) One's own side must possess absolute air supremacy in the operational area if heavy transport aircraft are to be permitted to cross enemy-held territory or to venture near enemy positions. The loss of a single heavy aircraft corresponds to that of approximately ten light transport aircraft, quite apart from the fact that the chance of losing ten smaller aircraft at once, even presupposing immensely effective enemy operations, is far smaller than the risk of losing one larger aircraft. \*

---

\* See above, pp. 216-219.

b) The employment of heavy transport aircraft requires a stable situation, both at the take-off bases and in the target area. Moreover, the minimum requirements in connection with airfield facilities are comparatively high for aircraft of this size and complexity. Any element of uncertainty, no matter how trivial it may be, is enough to jeopardize accomplishment of the operation. Apart from the fact that a great many airfields are simply not equipped to accommodate supply operations with heavy transport aircraft, it must be remembered that conditions at otherwise suitable airfields can change rapidly and unexpectedly. If the ground has been softened by rain, for instance, or if stretches of the runways have been damaged by bombardment or artillery fire, light and medium transport aircraft can still manage to take off and land. The chances of finding suitable airfields to replace ones lost to the enemy are much slimmer than would be the case with light or medium aircraft. Also, a heavy transport aircraft which must be abandoned because of minor damage represents an extremely grave loss in terms of the potential effectiveness of future air transport operations.

c) Last-minute adaptation of an air-supply operation to changing conditions in the take-off or target area is far more difficult to accomplish with heavy transport aircraft and, even when it can be accomplished, far less thoroughgoing than with light or medium aircraft. Air transport commanders are better off with a force composed chiefly of light and medium aircraft, since they guarantee a higher degree of flexibility and greater scope for variation.

d) In the case of air-supply undertakings of clearly limited duration, the use of heavy transport aircraft may well be uneconomical, since it would represent a situation in which the aircraft, without being fully exploited as far as maximum payload is concerned, are exposed to exactly the same degree of risk as if they were carrying a full load.

All in all, the employment by Germany of heavy transport aircraft for air-supply operations during World War II was not particularly encouraging. The weaknesses demonstrated could not be attributed exclusively to the haste with which aeronautical development was carried out at that time; most of them were inherent in the aircraft type, and it is extremely doubtful that very much can be done to overcome them in the future.

Taking all of these disadvantages into account, we cannot

escape the conclusion that air-supply operations require a medium transport aircraft, capable of moving medium weapons, small-size vehicles, and other equipment of the same category from a given take-off base to a given utilizer of air transport services.

3) Loading and Unloading. The ease and speed with which a transport aircraft can be loaded and unloaded are factors of particular importance in an air-supply operation. While it can usually be assumed that there will be appropriate loading aids and adequate personnel available to simplify matters at the take-off base, the process of unloading the aircraft at the target airfield must either be so simple that it can be accomplished without outside assistance, or a way must be found to transport the necessary unloading equipment in the aircraft itself without causing a substantial reduction in the transportable payload. If the cargo can be pulled out or driven out, the unloading process will be considerably expedited. It may happen frequently that transport aircraft will have to be unloaded in the target area under pressure of time or in the face of enemy attack; thus the technical equipment concerned must be that best able to expedite the unloading process and to get the aircraft back into the air in the shortest possible time.

4) Flight Characteristics. The requirements in respect to flight characteristics are the same as those established for transport aircraft engaged in combat employment with an airlifting force. A relatively high cruising speed is desirable but not absolutely necessary. The aircraft must be easily operable at extremely low altitude, for low altitude flight during the approach and return trips will probably always remain the most practical method of crossing enemy-held territory in the absence of friendly air supremacy.

5) Armament. Air-supply operations, to a far greater extent than any of the other missions demanded of transport aircraft, require that the aircraft be equipped with adequate defensive armaments. Regardless of which side may possess air superiority, every airlift undertaking mounted to supply an encircled force must inevitably develop into a more or less uninterrupted series of flights between the base of operations and the target area. It is unlikely that fighter aircraft will be available for continual escort duty unless this proves to be absolutely necessary; moreover, air-supply operations should not have to be dependent upon the availability of a fighter escort. Thus, the best defense for the transport aircraft should lie ideally in its



own airborne armaments.

6) Technological Requirements. The construction of a suitable aircraft for air-supply operations must be such as to make possible the repair of minor damages or the installation of spare parts with relatively little loss of time even under the extremely primitive conditions often found in the target area. The construction of the Ju-52, for example, was so simple and so robust that it was often possible--with the help of two or three Ju-52 wrecks--to repair a less seriously damaged aircraft well enough so that it could return to its take-off base under its own power. The more complicated the construction is, the greater are the potential sources of technical failure and consequently the chances of a breakdown in the midst of air-supply operations.

#### D. Air Transport Operations

The third type of employment to make its demands on the technological development and construction of a suitable transport aircraft is the accomplishment of pure air transport missions. This can best be compared with the freight and passenger transport network maintained by a commercial airline, appropriately expanded to meet the requirements of large-scale military operations. The basic requirement here is the need to move as much cargo as possible over relatively long distances in order to permit surprise shifts in front operational areas, emergency delivery of supplies, and the maintenance of constant liaison with the front.

From the point of view of the size of the aircraft--and consequently the size of the available cargo space--heavy transport aircraft are to be preferred for pure transport actions, apart from courier flights and the movement of mail and other light cargo. Purely from the organizational standpoint, for example, it is easier to arrange the movement of 200 tons of materiel, personnel, or supplies between two far distant points in two flights with ten aircraft, each capable of transporting a payload of ten tons, than in two flights with fifty aircraft with a maximum payload of two tons each, especially in view of the fact that the smaller aircraft may have to make intermediate landings to refuel. In short, there are a number of factors which argue for the use of heavy transport aircraft--their greater flight range, the saving in time, their greater economy of operation, the relative simplicity of the loading and unloading process, the comparatively small operations staff needed, and the small number of flying and technical personnel

required to keep them in operation.

The advantages of heavy transport aircraft are even more apparent when they are committed together with other air units within the framework of a single large-scale operation. While the heavy transport aircraft are utilized in an airlift from the rear area to the front, the medium and light transport aircraft take over the task of moving the cargo from the front across enemy-held territory to the target area, i. e. to the utilizers of transport services.

An additional advantage is that heavy transport aircraft are large and powerful enough to permit the transport of vehicles, large items of equipment, and awkwardly shaped objects. This means that supplies of this type can be flown directly from the storage depot or factory to the area of operations at the front, thus becoming available to the troops far sooner than would be the case if they had to be moved by surface transport. It goes without saying, however, that air transport under these circumstances is justified only if there is genuine need for speed.

Still another, most appropriate use lies, for example, in the possibility of transporting an entire parachute regiment to the front in a relatively small number of aircraft. In this way, the paratroopers can be employed in a surprise attack, with far less risk that the enemy may have been made aware of what was coming by lengthy preparations involving a large number of transport aircraft.

Our section on transport aircraft cannot be concluded without mention of one other, quite different type of aircraft, which will presumably be closely connected with the air transport force of the future.

#### E. Freight Gliders

The freight gliders were developed originally by and for the parachute forces, and their debut in military operations was within the framework of parachute and airlanding operations. The basic principle involved, of course, was the concentration of the striking power of an entire paratroop group in the form of a single paratroop aircraft capable of landing its charges at a specified point. The fact that the glider could be released by its towing aircraft at some distance from the target area, thus permitting it to approach its goal almost

soundlessly, was also a definite plus in maintaining the element of surprise. In addition, the utilization of freight gliders was an extremely effective way of obviating the otherwise highly vulnerable interval between the landing of the parachute forces and the recovery of their weapons and equipment containers, for with a freight glider the paratroopers could keep their gear with them at all times and could thus be fully capable of action from the very moment they landed. Essentially, the freight glider was primarily a combat instrument for the paratrooper force.

The use of freight gliders in air transport missions, and particularly in air-supply missions to encircled forces or to isolated advanced bases, would have resulted in a considerable increase in the total supply tonnage transported. Their use was practicable, however, only under very special conditions.

As a result of their extremely hybrid construction, the freight gliders were highly vulnerable both to artillery damage and to changes in weather conditions. Finding parking facilities for them and keeping them serviced were difficult enough, while the problems involved in getting them to the operational area where they were to be employed were nearly insurmountable. Air transport, of course, which would have required an especially equipped ground organization over the entire length of the route, was out of the question; rail transport was the only solution, and the demands made on space and handling facilities were tremendous. The preparations needed before freight gliders could be put into action required a highly specialized technical support organization, which also had to be moved by rail into the operational area.

Nevertheless, freight gliders could be utilized in an air-supply undertaking as a last resort and as a purely temporary measure. If the transport aircraft were no longer able to land, for example, and if air-drop missions were unable to provide all the items required by the encircled force, then the freight glider could be converted into a kind of giant "supply container," to be guided carefully to its target and delivered directly to the recipients. This was surely a better solution in many instances than the frequently inexact placing of containers delivered by air drop. Moreover, this method had the advantage of assuring the safe transport of more fragile items, such as delicate technical instruments and fuses. In spite of all this, though, the disadvantages inherent in the utilization of gliders as a last-resort kind

of supply drop far overshadowed the advantages. In most cases, the total loss of the glider had to be accepted as a foregone conclusion; at the very least, it was unavailable for further operations for some time, until the difficult business of getting to it and preparing it to be picked up again could be accomplished. And even though the material loss involved might be made up easily through new production, the glider pilot was bound to be inaccessible for quite a while, since the nature of glider supply missions automatically precludes the possibility of a landing by engine-driven aircraft.

To be sure, one technical innovation which was first brought up during the war would have made a vast difference in the utilization of freight gliders in air-supply operations. If the technological prerequisites could have been perfected, and the technique of picking up landed gliders from the air by powered aircraft further developed, then most of the disadvantages inherent in the use of freight gliders would have been eliminated.

From the foregoing, it is apparent that the medium transport aircraft is the best suited for all three types of transport employment. The only possible disadvantages are its limited payload capacity and the restrictions imposed by the relatively small dimensions of its cargo space. Thus, it will probably be most advisable to adopt a medium aircraft as the standard instrument of air transport and to equip the majority of the transport units with it. In addition, supplementary heavy transport units can be set up to increase the potential scope of air transport actions. Light transport aircraft should be used, if at all, only for units which will be definitely restricted to special operations, such as commando missions, together with parachute forces. Otherwise, these aircraft should be limited to routine passenger flights, mail transport, and courier missions.

The requirements discussed above in connection with transport aircraft are based on a study of the various aircraft models available to the German air transport forces during World War II and on the conclusions which can be drawn from the experience gathered during the employment of these models. Developments have continued, of course, in the air forces of other nations, while developments in the German Luftwaffe came to a complete halt--not in 1945, but even earlier.

Final conclusions, then, and definite views concerning the

establishment of a future air transport force can be voiced only after thorough study of the developments which have taken place in the meantime. A good many of the things discussed as ideal requirements here presumably will be taken for granted today, and others may no longer be necessary, having been replaced by still newer demands. We must content ourselves with pointing out, however, the absolute necessity of assuring that the Headquarters, Air Transport Forces be permitted an influential voice in developments in this field.

Section X: The Ground Organization and the Organization of Supply Agencies and the Users of Supply Services

A. General

In order to guarantee successful completion of their missions, the air transport units must be freed of all those tasks which are not directly connected with the tactical, flight-technical, or ground-technical conduct of operations. All the various demands to be met by airfields in the take-off and target areas must be investigated and guaranteed by the local ground organization. All the requirements having to do with the supplies to be carried by the transport units must be dealt with in advance by the supply agencies and the users of supply services. The various areas of endeavor must be determined in accordance with administrative, geographical, and technical transport aspects, and they must be defined with unequivocal clarity if the preparations for and the execution of the operation are to be accomplished effectively and smoothly.

The air transport agencies involved must be guaranteed a measure of influence on the activity of the individual command headquarters and the latter's subordinate agencies, insofar as such activity concerns the field of air transport. The influence-wielding agency should, whenever possible, be the headquarters entrusted with the conduct of the operation. The objective to be accomplished must be evaluated carefully and expertly in terms of the available facilities and the situation in force at the time, in order to determine the outside limits of the operation and to set up a definite schedule for the course of the action. This schedule then becomes the basis for the preparations to be carried out and the roles to be played by each of the agencies involved. Close cooperation in the initial planning stages represents the best assurance of close coordination at all levels later on and precludes subsequent instances of overlapping authority and

misunderstanding, thus eliminating a common source of difficulty.

In order to achieve this close coordination, it is imperative that all those agencies which might conceivably ever have anything to do with air transport be familiar with its basic principles in their fullest scope. In view of the nature of air transport operations, it is quite conceivable that any unit of a modern armed force, with very few exceptions, might at some time become a utilizer of air transport services. By the same token, almost any element of a ground force could be faced with the task of supporting an air transport action, either in peacetime or during war. Therefore, it is one of the most important duties of the Headquarters, Air Transport Forces\* to provide all headquarters at the same echelon with complete information regarding the guiding principles of air transport activity, so that these headquarters in turn will be in a position to issue the orders and instructions required to fit their subordinate agencies for their respective roles.

#### B. Ground Organization

The activity and the methods of operation of the technical ground organization are of decisive importance in keeping the course of an air transport action on schedule. Local conditions at the airfields in the take-off area and at the landing fields in the target area are the two pillars which must support the entire operation. The radically differing method of employment applicable to an air transport force, in contrast to that peculiar to tactical or strategic air units, has naturally resulted in a number of innovations and modifications in the handling of air traffic. During the early years of the war, the local ground organization agencies found it extremely difficult, not only from a technological but also from an administrative point of view, to adapt themselves to these new conditions. Precisely in this connection, it must be emphasized that there was never any lack of willingness to try to surmount the difficulties involved and to mitigate woefully inadequate facilities by recourse to all possible auxiliary measures and to all manner of improvisations. In the taxing operations carried out during the harsh Russian winter, technical personnel performed unbelievable feats to serve the air transport units. At the same time, it must be admitted that some previous knowledge of the characteristics peculiar to the employment of air transport units would have permitted

---

\* See above, p. 338.

the ground organization to prepare itself far better for the missions it was to face in Russia. This would have made things easier for all concerned.

It is important, therefore, to examine the role of the ground organization in an air transport operation in terms of the "principles of employment" applicable to it.

1) Initial Planning. Appropriate agencies of the technical ground organization must be brought into the initial planning of an air transport operation at the earliest possible moment. It will be their task to evaluate the conditions obtaining in the take-off and target areas against the potential requirements growing out of the kind and tentative scope of the operation. Their investigation and determination must be completed as soon as possible so that there may still be time enough to initiate the measures needed to remedy any defects and deficiencies.\* The ground organization representatives must be told whether they will be dealing with combat employment, with a short-term or permanent air transport action, or with an air-supply operation of the airlift type. This information is of vital importance in determining the preparations which they must make. Although it may not always be possible to give them exact information (because of lack of time, the need for secrecy, or because the enemy's situation is too unclear to permit exact determination), a general indication of the type of action anticipated will do much to facilitate the necessary planning and preparations.

In the case of an anticipated air-supply operation, it is a matter of basic principle that the ground organization must undertake to investigate and evaluate the suitability, in terms of air transport missions, of every airport, every advanced field, and every conceivable landing area within the potential target area. The results of these investigations should be codified, filed in a number of central headquarters agencies (the Headquarters, Air Transport Forces for one), and kept continually up to date. In the course of time such a file would present an easily accessible survey of the possibilities and limitations of each and every airfield and would be an invaluable aid during the initial planning of an air transport operation. The points to be checked in setting up such a survey file are the following:

---

\* See above, p. 318 ff.

a) Suitability of runways and landing strips for transport aircraft.

b) Availability of loading and storage areas (or the ease with which such facilities could be improvised).

c) Availability of stationary fuel pumps, facilities for transporting gasoline (railway tank wagons, tank trucks), and refueling equipment (extra pumps, facilities for direct fueling from tank to aircraft).

d) Availability of stationary facilities for the handling of air traffic (traffic control, illumination of airfield limits and obstacles, night illumination, navigation lights), ability of airfield commandant to provide provisional facilities (this point should be investigated carefully and clearly explained in the planning file), and strength of available technical personnel.

e) Maximum capacity of available billeting facilities, including provisional shelter (barracks, tents, auxiliary buildings, as well as any villages or towns in the vicinity of the airfield), messing facilities, and adequacy of sanitary equipment.

f) Availability of assembly points for troop elements awaiting transport and of storage areas for supplies, either at or near the airfield; ease with which supply processing depots could be established; availability of feeder routes and ease of access to loading areas; connections with local railway, highway, and waterway transport means, including indication of loading and unloading facilities.

g) Availability of technological equipment, maximum capacity thereof, and the possibilities of expanding technical services by requisitioning additional equipment and personnel.

h) Availability of signal communications facilities (internal communications network, ease with which connections can be established to other networks), direction finding equipment, homing beacons, air traffic control equipment, and the possibilities of expanding these facilities (to be investigated on the spot and clearly explained in the planning file).

No detail is too small to be considered important in expanding



this body of information and in keeping it up to date, for the Preparations Staff\* would be relieved of a good deal of painstaking work if there were already reliable information on file concerning the airfields or airfield areas for which an air transport action is being planned. If such a file had been available in Germany during World War II, a number of fiascos, with their far-reaching effects, might have been avoided.

2) Problems During Operations:

Maintenance

The moment the first transport aircraft take off for their mission marks the beginning of a period of maintenance requirements which can no longer be met by the air transport units themselves. We have stated that each air transport unit should be so organized that it can, if necessary, be self-sufficient as far as maintenance services are concerned; nevertheless, during the course of a lengthy mission, the transport units are bound to depend to some extent on the facilities of their take-off airfields. Their own capabilities in this respect are intended to make them independent of a ground organization only when such independence is an absolutely necessary evil, and even then only for a short time; they are in no case to be thought of as more than an improvised solution to be applied in the event of dire need. In fact, these capabilities should probably be ignored completely as long as the local ground organization is still in a position to function. Their role becomes important only when the local organization is no longer capable of maintaining the unit's operational readiness at the required level.

Communications

The moment air transport operations are launched, the signal communications network servicing the take-off area will probably be so fully occupied that every single circuit is exploited to the limit. As a result, any superimposition of outside telephone, telegraph, and radio traffic will probably prove unfeasible. Thus it is mandatory that the supply agencies, the air transport agencies, and the users of transport services be able to communicate with one another by means of a network reserved for their exclusive use.

---

\* See above, p. 323 ff.

### Supplies for the Air Transport Units

It is the duty of the operation commander and his staff to see that adequate arrangements are made to supply the transport units with aviation fuel, ammunition, equipment, and spare parts. The actual transport and issue of these items, however, is the responsibility of the appropriate agencies of the technical ground organization. The latter must be kept continually informed as to the average consumption by the transport units and the anticipated scope of supply shipments. During World War II, the difficulties were legion whenever several air units of varying type were based at a single airfield. Understandably, it was impossible for the airfield commandant to fulfill the countless demands made upon him and his personnel. Thus, he was faced with the unpleasant task of determining the relative priority of these demands, a task which he was in no position to undertake and one which never should have been demanded of him in the first place. His difficulties were augmented by the fact that the unit commanders were not above resorting to their rank and position or imputing overly great significance to their particular operations. In order to avoid this in the future, it is desirable to handle the supply channels for the air transport forces separately, especially when the requirements are expected to exceed normal standards. Under these conditions, each shipment would be specifically marked for delivery to the transport forces, thus obviating the need for an arbitrary decision and eliminating any consequent difficulties.

### Personnel

No matter what facilities may be available, no matter how easily they might be expanded in case of need, they are irrelevant if there is not sufficient personnel on hand to operate them. On the other hand, it would be ridiculous to expect the ground organization to be so permanently overstaffed everywhere that each local element would be capable of meeting the increased demands occasioned by a sudden assignment of additional air units. This would presuppose the availability of a reserve force of unprecedented size, a force, moreover, which would be consigned to idleness a good deal of the time. Nevertheless, it must be possible at all times to free the necessary personnel from some area where they can be spared and to bring them to the operational area where they are needed. And these new personnel must be fully familiar with the missions expected of them. Further, it must be possible to form "special duty airfield commands" which

will be capable of carrying out their assignments at emergency airstrips, alternate airfields, and advanced landing areas. This can be accomplished only if the entire technical ground organization is thoroughly familiar with the exigencies of air transport operations. It must be the responsibility of the Headquarters, Air Transport Forces to see that the necessary orientation is incorporated into the training of all technical personnel and that their knowledge of air transport operations is kept up to date. \*

There are, of course, a good many more problems of primary and secondary importance which have not been dealt with in the foregoing discussion but which may well turn up during the course of an operation. Unless completely new factors, such as technological advances, are involved, all of these problems can be solved satisfactorily within the framework of the principles which have been discussed. The important thing, of course, is that there must be close coordination between the forces concerned, not only during the operation itself but at all times. If this is the case, then we may be sure that effective cooperation between the flying units and the ground organization units can be taken for granted. And such cooperation, in the last analysis, is not intended to provide either force with any particular advantage, but to serve the higher goals of air transport activity as a whole.

#### C. Support of Air Transport by Supply Agencies and the Troops Being Supplied

In the various reports of the airlift undertakings carried out during World War II, there is considerable criticism of the lack of cooperation between the air transport forces, the supply agencies (as the source of the transported goods) and the users of transport services (as the destination of these goods). In the majority of cases this unfortunate lack was definitely one-sided. It usually took a great deal of patience and persistence on the part of the air transport commander to effect any improvement in the situation.

In any joint undertaking involving air transport forces, the commanders of the supply agencies and of the troop elements to be supplied by air must be fully aware of the absolute necessity for close cooperation with the command headquarters of the transport forces

---

\* See above, pp. 341-342.

concerned. Ideally, it should not be the air transport commander alone who decides for or against a certain supply operation; the final decision should be a joint one, arrived at after joint deliberation and planning.

Once the decision to undertake an air-supply operation has been made, the exchange of liaison officers between the participating agencies is a great help in assuring coordination of the various aspects of preparatory activity. This should be discussed and agreed upon during the early planning stages.

The supply headquarters concerned and its subordinate elements should be responsible for the following phases of preparation:

1) The requests submitted by the force to be supplied must be evaluated in terms of their urgency, necessity, and volume, so that only so much air transport space will be committed as is actually required to alleviate the emergency and to keep the force supplied until relief measures can be effected by the ground forces.

2) In determining the scope of its responsibilities and authority, the supply agency concerned must always bear in mind that it--and not the air transport forces--is the actual entrepreneur of an air transport or air-supply mission. This means that the supply agency must be responsible for anything and everything affecting the goods or personnel to be moved until they are safely loaded into the transport aircraft. If the supply unit of the force receiving transport services is also a part of the issuing supply agency system, the latter's responsibilities begin again with the unloading of the aircraft within the target area. The operations staff of the air transport force is responsible only for the carrying out of the actual transport flights.

3) The responsible supply agency must assume the task of organizing, delegating, and supervising the work of transporting and processing the supplies, on behalf of both its own subordinate elements and the supply organization of the force utilizing transport services.

The first step in preparing for an air-supply undertaking, to be taken by the supply agency staff responsible for transport, is the movement of the supplies into the take-off area. Once this has been accomplished, the various other specialized elements (supply officers, column commanders, supply depot personnel, and a host of other

experts with the necessary auxiliary personnel) must assume responsibility for handling the goods until they have been loaded into the transport aircraft and, again, once they have been unloaded at the target airfield.

To begin with, of course, the supply agencies cannot be expected to possess any detailed knowledge of the requirements peculiar to air transport operations. With the passage of time, however, it should be possible to orient all transport and supply personnel thoroughly and systematically and to keep their knowledge up to date.

The following are the most important factors to be considered:

a) The three participants must be able to communicate with one another at all times by means of a carefully-devised, simple, and brief reporting system. The supply agencies must be kept informed by the recipients of supplies not only of their supply requirements, but also of their supply stocks on hand and their rate of consumption; the recipients must be informed of the probable amount and type of supplies they can expect; and the air transport units must be able to report on the volume of transport space available and be given information as to the kind and urgency of coming supply flights. Only so long as the points of this triangle can remain in contact with one another is there any guarantee that air-supply missions will be accomplished smoothly and that unpleasant friction can be avoided.

b) The various liaison officers must see to it that the closest possible cooperation is maintained. In order to do this they must have at their disposal a reliable communications network which will permit them to contact each other and their superior headquarters directly by telephone, telegraph, or radio.

c) The distribution of supply goods among the participating transport aircraft must be carefully planned and the final plan rigorously followed. Because of this requirement, any changes in the type or volume of supplies, in the priority of the mission, or in the amount of transport space needed must be incorporated into the loading plan before the loading operation begins. In addition, supply storage depots at each take-off base should be well enough stocked to provide at least basic supplies (ammunition, gasoline, and foodstuffs, for instance) to take advantage of any extra transport space which may suddenly become available.

In addition to the storage depots needed in the vicinity of the take-off fields, it is strongly recommended that similar supply storage depots be established at the landing fields in the target area. Here, of course, they would be supply reception rather than supply distribution depots. In view of the specialized conditions under which an air-supply mission is carried out, it will probably always be very difficult to arrange for the immediate further transport of the landed supplies. It is hardly likely that sufficient supply columns will be immediately available at the moment the transport aircraft land to clear the unloading areas within a short time. Normally, the landing of the second wave of supply aircraft will find itself faced with a bottleneck. "Away from the airfield as soon as possible" is a logical requirement in the interests of the rapid and smooth accomplishment of every air-supply mission. The best solution is probably to be found in an intermediate storage depot, from which distribution can be made without the necessity of meeting definite time deadlines. Here, too, auxiliary personnel must be on hand in the requisite numbers.

d) The evacuation of wounded personnel from the target area must be organized by the supply agency headquarters in conjunction with the appropriate medical authorities. The transport crews cannot be expected to assume responsibility for such matters as selecting the personnel to be evacuated, transporting them to the airfield, loading them into the aircraft, and caring for them during the flight.

e) Loading personnel, who must be available in sufficient numbers, should include: especially trained men from the flying units (responsible for seeing that the aircraft are loaded in such a way as not to jeopardize flight performance or flight safety), others from the supply organization (responsible for seeing that the supply goods are handled properly), and auxiliary workers. In future, at least the trained personnel from the supply organization should be thoroughly familiar with the proper method of loading a transport aircraft with supplies. To facilitate this, the Headquarters, Air Transport Forces should organize special courses to instruct supply agency personnel in the loading of the various transport aircraft types for each kind of employment.

A complete "loading table," including loading data on all types of weapons and equipment, troop units with all their gear, and other typical cargoes for all the transport aircraft models, must be prepared as a constantly accessible handbook for loading personnel. A

manual of this type was planned during World War II, and work was even begun on it. Once such a book has been issued, loading personnel can familiarize themselves with countless technical details, such as loading facilities of the various aircraft models, load distribution, location of center of gravity, loading area dimensions, maximum loading capacities, capacity of the ground plates in the various models, methods of securing cargo, use of auxiliary storage equipment, and utilization of loading equipment. This will do a great deal to facilitate a most important part of the over-all operation.

Both the original training program and the subsequent issuance of instructional memoranda on innovations and changes should be supervised by a central agency and, above all, should not be limited to a small circle of experts. The training offered must become a part of the general knowledge of all personnel assigned to the supply field, for any supply unit could be confronted with the task of supporting an air-supply operation. The only aspects of air supply which may properly be excluded from this general training are those pertaining to supply by air drop. Specialized training is needed in this field, and once a central cadre of personnel has been given such training it can be assigned as a unit, together with the necessary empty containers and parachutes. The only requirement is that all personnel with this special training be registered centrally, so that they can be gathered together without delay when they are needed.

#### D. The Effect of Supply by Air Drop on Supply Organizations

The utilization of air drop as a method of supplying an encircled force must always be clearly limited in duration; in addition, it must be understood that it can be no more than a temporary measure, selected either as the first or as the last phase of a supply action. It is logical and justifiable only if suitable landing fields are not yet available in the target area (immediately following a paratroop landing, for example), or if normal air-supply flights are not expected to be adequate to fit the encircled force for a definitely limited combat action. Its employment as an alternative solution or regular supplement to surface supply operations is not recommended, inasmuch as the benefits to be gained are not sufficient to warrant the expenditure of effort involved. Supply by air drop has the following disadvantages for the supply agencies and the users of supply services:

- 1) high consumption of supply containers, parachutes, and

packing materials;

2) time-consuming processing of supply goods and packing of supply containers;

3) unfavorable ratio between the weight of the goods and the capacity of the containers;

4) impossibility of dropping awkwardly-shaped items;\*

5) reduction in payload due to the extra weight of containers, parachutes, and packing materials;

6) time-consuming complexity of the loading operation;

7) uncertain recovery of dropped containers (due to faulty aiming, damaging of containers, lack of system in recovery and distribution);

8) impossibility of utilizing return flights for the evacuation of wounded and return of personnel and empty supply containers.

During the war considerable experience was acquired in the dropping of supplies with and without parachutes and in the dropping of supply containers. The use of supply containers requires, to begin with, a great deal of surface transport space (railway cars and trucks) in order to bring the empty containers and related paraphernalia into the take-off area. Although relatively light in weight, the containers take up a lot of room. Since stability and uniform size were important, they were not constructed so that they could be taken apart and stacked for easy transport. As far as packing the containers was concerned the trick was to combine the contents in such a way that the space was neatly filled and the allowable weight not exceeded. If a container had to be repacked for any reason (for instance a last-minute change in the type of supplies), a delay in operations usually resulted. However, the containers do offer some guarantee that supplies can be dropped with relative certainty that they will not be broken or damaged. Thus they should be utilized chiefly for more delicate equipment, such

---

\* Editor's Note: Due to recent advances this disadvantage is much less significant now than it was in World War II.



as fuses and instruments. The dropping of supplies fitted with freight parachutes permits a good deal more leeway in the choice of items. Ammunition containers, gasoline drums, carefully packed bales of supplies, weapons, and even small vehicles can be dropped by this method.\* The decisive factor in each case lies in the construction of a freight parachute capable of reducing impact velocity to the lowest possible minimum. Loading personnel responsible for the assembling and packing of supplies for release with freight parachute must be especially trained for their job, and must go along on the drop runs, for the aircraft crews cannot be expected to handle the supply release operation in addition to their other duties. This requirement naturally presupposes that the loading personnel will be familiar with the functioning of airborne-storage and load-release equipment.

During the war a number of experiments were made in dropping certain types of supplies without freight parachutes, and this method proved to be satisfactory with such items as animal fodder (bales of hay and straw), clothing packed in sacks, bandage materials, and some kinds of foodstuffs. Any supplies which are dropped without parachute must, of course, be firmly wrapped in waterproof material. There is always a certain danger that the bundles will be damaged by the landing impact, and this cannot be entirely avoided even when the surface is relatively soft, such as deep snow, desert sand, or high grass. Even so, the technique was welcomed during World War II as a method whereby more complicated equipment could be spared for situations in which simple air drop was not feasible. In future, too, there is no reason why this technique should not be utilized whenever conditions are conducive to its successful application.

The two supply-drop techniques which we have just discussed (without containers, either with or without parachutes) have the advantage that the loads prepared can also be landed if necessary. In other words, these methods can be appropriately selected when there is some chance that a landing may, after all, be possible. For both possibilities may remain open until the aircraft have arrived over the target area. If they are able to land, then their payload capacity will have been fully utilized except for the weight of the freight parachutes, which will have to be brought back. If a landing proves impracticable,

---

\* Editor's Note: Today, palletized loads of much greater weight and dimension can be dropped by freight parachute.

then the mission is simply carried out by air drop. When the supplies are packed in containers there is little to be gained by landing, because the unloading of supply containers from the aircraft to the ground and the unloading of the supplies from the containers are usually complicated and time-consuming operations.

The points discussed in the foregoing section have given an indication of the important role played by the organization of the supply agencies and the utilizers of transport services in air transport operations. These elements should be responsible for creating the wider framework which must be available if the day-to-day conduct of operations is to achieve its goal of top performance coupled with rational utilization of the aircraft. The many air transport and air-supply actions carried out by the Luftwaffe during World War II prove the need for a thoughtfully developed and smoothly functioning organizational apparatus. Unfortunately, many of these actions provide negative evidence and serve to emphasize the insufficiencies and errors attributable to the lack of a proper organization. The air transport units were burdened with responsibilities which lay far beyond the limits of their appropriate field of endeavor and which represented a permanent drain on their strength.

It is of tremendous importance that the lessons of experience gathered in the field of air transport be evaluated thoughtfully and objectively and that the conclusions be conscientiously applied. In future, air transport in connection with supply operations will no longer be an untested innovation, and the supply organization can surely be expected to accept the increased responsibility accruing to it as a result of a rational division of the labor in the preparation and execution of air-supply missions.

#### Conclusion

With the consideration of future developments, this study on the air transport operations of the former German Luftwaffe has come to an end. We are perfectly justified in assuming that in the future it will no longer be the business of each separate nation to secure its territory and, if necessary, to defend it with armed force. There is a clearly recognizable tendency for nations to band together in alliances of power, in order to carry out these tasks more economically and more effectively. During the course of world history, great catastrophes

have often prepared the way for, encouraged, and even accomplished such a development. The practical, incisive, and realistic turn of mind of the modern generation tends to disparage the traditional ideals of national sovereignty, as dictated by emotional, popular, and ethnological factors, and to relegate them to the background. In addition, the advance of the technical sciences, which is hastened immensely by the requirements of armament for modern warfare, is making the world smaller and smaller. Communication among the peoples of the world is becoming more and more widespread, so that political boundaries will soon have little more than administrative significance. Gradually, political, economic, and military boundaries will tend to disappear, and the result will be a single, united complex which may or may not be ideologically uniform, but which in any case will be committed to the joint handling of common problems. In this sense, of course, the alliances, international agreements, mutual assistance pacts, and international organizations entered into by individual nations acquire quite a different significance as the potential forerunners of total integration. This significance will probably be most apparent and far-reaching in the military sector.

In the event of general integration, the territory which must be covered in joint-planning activity increases in area; at the same time, the potential strength of all the segments of the new entity is combined into a single, joint factor. And under the circumstances, this factor will play a much larger role than it could if each segment were functioning independently, even if the ultimate goal were the same for all of them. The same developmental trend which created and discarded mercenary troops and professional armies will also move on to discard national armed forces. Motivated by the common interests or needs which brought it into existence in the first place, the new supra-national entity will unite the military and economic potential of all the peoples living within its geographic limits. Questions of domestic or even national policy can hardly be expected, or permitted, to play a leading role in such a community, though to be sure, a radical change in this respect in one member could jeopardize the existence of the whole. Thus, the community would have the right and the duty to present such a development.

It will never be possible to tell in advance just when the need for joint action may arise, and with it the test of military potential. Likewise, there will be no way of predicting just where within the common territory a conflict may arise which is capable of threatening

not only the local area in which it takes place but the entire community. The most distant points on the surface of the earth are no more than hours away nowadays. The scene of military conflict may shift hundreds or even thousands of miles within a very short time. In the past, military operations ordinarily were carried out relatively near national boundaries; in the future, the preservation of the interests and the protection of the territory of a community of peoples will be inextricably bound to happenings taking place in remote corners of that territory. And a tiny flame, if it is not extinguished in time, can develop into a holocaust capable of engulfing the entire community. The only solution is the readiness and the ability to combat that flame instantly and decisively through joint action. The willingness to help must be a foregone conclusion; and the role assigned to air transport may well be decisive.

## FOOTNOTES

## Chapter 1

1. This chapter, and the others which follow, is based on the author's personal experience in various positions in the Air Transport Forces, from unit commander to Armed Forces Chief of Air Transport. Unless otherwise stated, the documents cited are to be found in the Karlsruhe Document Collection, USAF Historical Division Archives, Maxwell Air Force Base, Alabama. The most important air transport documents are contained in the following loose-leaf folders of the collection: A/VI/4, F/IV/4, F/VII/1, F/VII/2, G/VI/4d, G/VI/4dd.

## Chapter 2

1. This chapter, except where otherwise noted, is based on the following postwar reports: General der Flieger a. D. Paul Deichmann, Luftlandeaktion (Airlanding Operations) hereinafter cited as Deichmann Report; Generalleutnant a. D. Ruediger von Heyking, Fallschirmeinsatz des Kampfgeschwaders z. b. V. 2 zur Einnahme von Kreta am 20. 5. 1941 (The role of the 2d Special Duty Bomber Wing in the parachute operation during the capture of Crete on 20 May 1941) hereinafter cited as Heyking Report; Colonel a. D. Walter Erdmann, Kreta, der fliegerische Einsatz des Kampfgeschwaders, z. b. V. 1 (Crete, the employment of the 1st Special Duty Bomber Wing) hereinafter cited as Erdmann Report; Lt. Colonel a. D. Otto Baumann, Der Fallschirmjaeger-einsatz am Hohen Venn (The employment of parachute troops on the Hohe Venn); Lt. Colonel a. D. Walter Hornung, Transport der 1. Fallschirmjaegerdivision nach Ljuban (The transport of the 1st Parachute Division to Lyuban); Major a. D. Otto Augst, Lufttransportversorgung der rueckziehenden Truppen von Rhodos, Kreta and Balkantruppen (Air supply of the forces retreating from Rhodes, Crete and the Balkans).
2. See Bericht K. Gr. z. b. V. 9 -Einsatz Festung Holland, 10. 5. 1940 (Report of the 9th Special Duty Bomber Group's commitment against Fortress Holland, 10 May 1940), Classified, 14 May 1940. Appendix 12a to the German manuscript of this study.
3. Deichmann Report.

4. Heyking Report and Erdmann Report.
5. Lt. Colonel a. D. Walter Hornung, Lufttransportversorgung der Insel Kreta, Zeitraum 21. 5. bis 30. 6. 1941 (Air supply of the island of Crete during the period 21 May through 31 June 1941).

### Chapter 3

1. This chapter is based on: Akten des X. Flieger-Korps ueber "Weseruebung" (Documents of the 10th Air Corps concerning "Weser Exercise"); Ablauf des Lufttransportes fuer Norwegen - 1940 (The course of air transport operations to Norway - 1940) - excerpts from the War Diary of the 10th Air Corps, hereinafter cited as ALN; Vorarbeiten der 8. Abteilung des Generalstabes der Luftwaffe ueber den Norwegenfeldzug (Notes on the Norwegian Campaign prepared by Branch VIII of the Luftwaffe General Staff); Notizen des Luftwaffenfuehrungsstabes ueber die Luftlandung Oslo (Notes of the Luftwaffe Operations Staff on the Airlanding at Oslo); Die Luftnachrichtentruppe im Norwegenfeldzug (The role of the Luftwaffe Communications Forces during the campaign in Norway) prepared by Branch VIII (Military History) of the Luftwaffe General Staff; Kriegstagebuch der Kriegsmarine vom 1. - 11. 6. 1940 (War Diary of the Navy from 1 through 11 June 1940); Aufzeichnungen Major Pinagel, Ia Lufttransportchef Land (Notes by Major Pinagel, Operations Officer, Air Transport Chief, Land); General der Flieger a. D. Hans Geissler, Die Rolle der Luftwaffe in dem Norwegenfeldzug (The role of the Luftwaffe in the Norwegian Campaign); Bericht ueber den Einsatz der Luftwaffe bei der Besetzung von Daenemark und Norwegen, Ob. d. L. Fuehrungsstab Ic 3343/40 g. Kdos. vom 10. 4. 40 (Report on the role of the Luftwaffe in the occupation of Denmark and Norway, Office of the Commander in Chief, Luftwaffe, Operations Staff, Intelligence, file no. 3343/40, Classified, 10 April 1940); Einsatzmeldungen der K. Gr. z. b. V. 9 vom 9. 4. - 30. 4. 40 (Combat reports of the 9th Special Duty Bomber Group from 9 through 30 April 1940); Professor Dr. Walter Hubatsch, Die deutsche Besetzung von Daenemark und Norwegen 1940, 7<sup>er</sup> The German occupation of Denmark and Norway 1940<sup>er</sup>, "Musterschmidt" - Wissenschaftlicher Verlag (Goettingen, 1952), hereinafter cited as Hubatsch. In addition, the author has made use of information contributed by the commanders and squadron captains who participated in the operation.

2. Hubatsch, pp. 24-28.
3. Ibid., p. 15.
4. Ibid., pp. 178-182.
5. Franz Halder, Hitler als Feldherr ["Hitler as a Field General"], Dom-Verlag, (Munich, 1949).
6. Winston Churchill, The Second World War, The Gathering Storm, Book Two, Houghton Mifflin Co. (Cambridge, 1948), p. 591.
7. ALN, pp. 3-4.
8. Very few official records were available to the author in the preparation of this section. He has been forced, for the most part, to rely on contributions by personnel who participated in the undertakings described. Reports by the following persons were utilized: Colonel a. D. Starke, Lt. Colonel a. D. Walter Hornung, Major a. D. Fath, Major a. D. Dudeck, Captain a. D. Garms, Generalleutnant a. D. Ruediger von Heyking, Colonel a. D. Walter Erdmann, Colonel a. D. Beckmann, Major a. D. Thomsen, General a. D. Buchholz. In addition, use was made of the following reports: Sondereinsatz Halfayapass Dezember 1941 - Februar 1942 (The special mission at the Halfayapass, December 1941 through February 1942); Sondereinsatz Oase Siwah 23. 7. 42 (The special mission to the Siwa Oasis on 23 July 1942); Einsatz der Me-323 Italien - Sizilien - Tunis vom 8. 11. 42 - 22. 4. 43 (The employment of the Me-323 in Italy, Sicily and Tunis from 8 November 1942 through 22 April 1943) hereinafter cited as EMIST; Absprungplaetze: Italien, Sizilien, Griechenland, Kreta -- Einsatzplaetze: Afrika - Tunis (The take-off bases in Italy, Sicily, Greece, and Crete -- The landing bases in Tunis, Africa); Flugplaetze mit Peil- und Fundstellen (Airfields equipped with radio direction-finding facilities); Leistungsbericht von Kreta nach Afrika vom 10. 2. - 30. 6. 42 (A summary of the missions flown between Crete and Africa from 10 February 1942 through 30 June 1942); Lufttransportleistungen im Mittelmeer, Januar-Mai 1942 (The missions of the Air Transport Forces in the Mediterranean from January through May 1942); Taetigkeitsbericht der Transportstaffel des 2. Fl. Korps (Activity report of the Air Transport Squadron of the 2d Air Corps); Verluste

8. (cont'd)  
 der IV. /K. G. z. b. V. 1 vom 1. 7. -19. 11. 42 (Losses sustained by the 4th Group, 1st Special Duty Bomber Wing, from 1 July through 19 November 1942) taken from the Group War Diary; Luftversorgung von Afrika vom 18. 11. 42 - Mai 1943 (Air-supply operations in Africa from 18 November 1942 through May 1943) an excerpt from a report prepared by General der Flieger a. D. Paul Deichmann in 1947; Lufttransporte von Italien nach Tunisien, Februar-April 43 (Air transport missions from Italy to Tunisia, February through April 1943) an excerpt from a study prepared by Branch VIII (Military History), Luftwaffe General Staff, under date of 31 August 1944; Auszug aus einer Meldung der Luftflotte 2 an OKL vom 12. 4. 1943 (Excerpt from a report transmitted to the Luftwaffe High Command from the Headquarters, Second Air Fleet on 12 April 1943). All of the above cited reports can be found in the Karlsruhe Document Collection. Some of them are included as appendices to the German manuscript of this study.
9. See EMIST.

#### Chapter 4

1. This section is based on: "Transportflieger" Entwicklung und Einsatz waehrend des Krieges (Air transport, its development and commitment during the War), a report prepared by Generalmajor a. D. Fritz Morzik while he was a prisoner of war; Luftversorgung der Festung Demjansk waehrend ihrer Einschliessung vom 15. II bis zum 19. V. 1942 (Air supply of the Fortress Demyansk during its encirclement from 15 February to 19 May 1942) a postwar report by General Morzik and Captain Metscher; conversations and correspondence with commanders and squadron officers who participated in the Demyansk airlift.
2. Generalleutnant H. J. Rieckhoff, Trumpf oder Bluff! ["Trumpf or Bluff!"] Interavia (Geneva, 1946), p. 262 ff.
3. This section is based on: The following wartime reports by participants in the Stalingrad Airlift: Erfahrungsbericht L. T. F. Kuehl, 10. 2. 1943 (He-111 Verbaende) (Report of Air Transport Chief Kuehl, 10 February 1943) Colonel Kuehl was a wing commander and directed the employment of He-111 units in the



3. (cont'd)  
 Stalingrad Airlift, and Erfahrungsbericht L. T. F. Morzik, 12. 2. 1943 (Ju-52 Verbaende) (Report of Air Transport Chief Morzik, 12 February 1943) Colonel Morzik commanded the Ju-52 units in the Stalingrad Airlift [these two reports bound together in G/VI/4d, Karlsruhe Document Collection]; Bericht des Major Thiel ueber die Beschaffenheit des Platzes Gumrak, 21. 1. 1943 (Report by Major Thiel on the condition of the airfield at Gumrak, 21 January 1943) Major Thiel commanded the 3d Group, 27th Bomber Wing; General der Panzertruppe Hube, Erfahrungsbericht ueber die Luftversorgung der Festung Stalingrad (Report on the air supply of Fortress Stalingrad); Einsatzberichte LTF Stalino Major Willers (Mission reports of Air Transport Chief Stalino Major Willers) Major Willers commanded the 200th Special Duty Bomber Group composed of long-range transport aircraft, hereinafter cited as Willers Reports. Excerpts from the war diaries of General Fiebig (8th Air Corps), hereinafter cited as Fiebig Diary, and General Pickert (9th Antiaircraft Artillery Division), hereinafter cited as Pickert Diary. Postwar reports (in the possession of the author) from the following participants in the Stalingrad Airlift: Generalmajor a. D. Schulz, Quartermaster General, Fourth Air Fleet; Major a. D. Uhl, Commanding Officer, 5th Special Duty Bomber Group; Lt. Colonel a. D. Otto Baumann, Commanding Officer, 50th Special Duty Bomber Group; Captain a. D. Mueller, Operations Officer, Office of the Air Transport Chief (Ju-52 units). Published Works: Generalmajor a. D. Herhudt von Rohden, Die Luftwaffe ringt um Stalingrad ["The Luftwaffe's struggle for Stalingrad"/, Limes Verlag (Wiesbaden, 1950), hereinafter cited as von Rohden; Heinz Schroeter, Stalingrad bis zur letzten Patrone [Published in English under the title Stalingrad, E. P. Dutton (New York, 1958)/ Kleins Druck- und Verlagsanstalt (Lengerich, Westphalia, 1953) hereinafter cited as Schroeter. Finally, reports of interrogations-- on file in the Karlsruhe Document Collection--of German prisoners of war.
4. von Rohden, pp. 19-20, and Fiebig Diary.
5. Fiebig Diary and Pickert Diary.
6. von Rohden, p. 16.
7. Ibid., pp. 12-13.

8. Ibid., pp. 20-21.
9. See G/VI/4d, Karlsruhe Document Collection, for the exact wording.
10. von Rohden, pp. 19-20; Fiebig Diary and Pickert Diary.
11. Schroeter, p. 91.
12. Willers Reports.
13. Ibid.
14. von Rohden, p. 135 (excerpt from the order issued by the Air Fleet on 26 Nov. 1942).
15. Fiebig Diary.
16. Ibid.; von Rohden, pp. 43-50.
17. Ibid., p. 59; excerpts from the diary of Field Marshal Erhard Milch.
18. Fiebig Diary.
19. von Rohden, pp. 76-78.
20. Generalmajor a. D. Morzik, Die Bekaempfung der deutschen Transportfliegerverbaende im Ostfeldzug, Erfahrungen waehrend der Versorgung Stalingrads (Methods used to combat German air transport units in the Eastern Campaign, based on experience gained during the Stalingrad Airlift).
21. Diagrams in Appendix 26 of the German manuscript of this study, which are based on sketches taken from the Milch Diary, show some typical weather situations for the operational area.
22. For additional opinions of high-ranking officers who had close, but secondhand, knowledge of the circumstances which contributed to the decision to have the 6th Army remain in Stalingrad, see the letters, reports, and answers to questionnaires in G/VI/4d and G/VII/4dd, Karlsruhe Document Collection.

23. See Generalleutnant a. D. Hermann Plocher, *Der Feldzug im Osten, 1941-1945, Viertes Buch: Der Einsatz der deutschen Luftwaffe im Osten, 1942* (The Eastern Campaign, 1941-1945, Book Four: Employment of the German Air Force in the East, 1942), a German manuscript, pp. 317-324.
24. Major a. D. Willers, *Luftversorgung Kuban-Brueckenkopf und Kampfeinsaetze Stalingrad* (Air-supply operations at the Kuban Bridgehead and combat missions at Stalingrad), a report by the commander of the 200th Bomber Group.
25. This section is based on a postwar report prepared by Lt. Colonel a. D. Baumann, former commanding officer of the 2d Group, 3d Air Transport Wing, and original documents from the files of the 2d Group, 3d Air Transport Wing.
26. This section is based on a postwar report (in possession of the author) prepared by Lt. Colonel a. D. Walter Hornung, former commanding officer of the 3d Group, 2d Air Transport Wing and of the 30th Air Transport Group (He-111's).
27. This section is based on Generalmajor Morzik, Air Transport Chief II, *Luftversorgung der 1. P. A.* (Air-supply operations for the First Panzer Army) and Major Walter Hornung, commanding officer of the 30th Air Transport Group, *Versorgung der 1. P. A.* (Supply operations for the First Panzer Army).
28. This section is based on Generalleutnant a. D. Gerhard Conrad, *Zusammenstellung aus dem Originaltagebuch des Versorgungsfuehrers Budapest* (A compilation from the diary of the Air Transport Chief Budapest), Appendix 28 to the German manuscript of this study, hereinafter cited as Conrad Diary, and notes by Major Walter Hornung, operations officer on General Conrad's staff, notes in the possession of the author of this study.
29. Conrad Diary.
30. This section is based on postwar reports by Generalmajor a. D. Morzik and Lt. Colonel a. D. Hornung as well as excerpts from the War Diary of the 2d Group, 3d Air Transport Wing.

Chapter 5

1. See Major a. D. Otto Baumann, commander of the 2d Group, 3d Air Transport Wing, Fallschirmjaegerereinsatz "Hohes Venn" am 17. 12. 1944 (The employment of parachute troops on the Hohe Venn, 17 December 1944).
2. This section is based on postwar reports by Lt. Colonel a. D. Walter Hornung, former commander of the 30th Air Transport Group, and Major a. D. Willers, formerly attached to Third Air Fleet as special officer in charge of reconnoitering landing and air drop areas in western France, hereinafter cited as Willers Report.
3. Willers Report.
4. See the study, Luftversorgung der Festung Cherbourg in Juni 1944 (Air-supply operations to the Cherbourg fortress, June 1944) prepared by Branch VIII (Military History), Luftwaffe General Staff.

## Appendix 1

## A LIST OF THE AIR TRANSPORT UNITS

<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
1st Bombardment Wing for Special Employment (1st Air Transport Wing)	Morzik Trautvetter Jaeckel Schroeder Koegl	Poland, Norway, Holland, France, the Balkans, Crete, the Russian front, Stalingrad, with the First Panzer Army, the Crimean Peninsula, Kurland, Breslau, Kurland, Schleswig-Holstein at the end of the war
I Group, 1st Bombardment Wing for Special Employment (I Group, 1st Air Transport Wing)	Ziervogel Morzik Witt Jaeckel Foerster Maess Schmidt	
II Group, 1st Bombardment Wing for Special Employment (II Group, 1st Air Transport Wing)	von Lindenau Drewes Willerding Neundlinger Stippschuetz Dudeck Klamke*	Poland, Norway, Holland, France, the Balkans, Crete, southern sector of the Russian front, Demyansk, Chelm, assigned to Commander in Chief South, Stalingrad, France, parachute operations in Sicily
III Group, 1st Bombardment Wing for Special Employment (III Group, 1st Air Transport Wing)	Zeidler Starke Hagena Schroeder Fath	Poland, Norway, Holland, France, Albania, assigned to Commander in Chief South, the Russian front

<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
IV Group, 1st Bombardment Wing for Special Employment (IV Group, 1st Air Transport Wing)	Jansen Beckmann Schneidenberger Fath Scheuring	Poland, Norway, Holland, France, the Balkans, Demyansk (as the Bombardment Group Posen), Stalingrad, assigned to Commander in Chief South, Greece
2d Bombardment Wing for Special Employment (2d Air Transport Wing)	Conrad Drewes Poetsch von Heyking Buchholz De Salange Drabbe Erdmann	
101st Bombardment Group for Special Employment	Mundt	Norway, Holland, France, Crete, disbanded in 1941
102d Bombardment Group for Special Employment (III Group, 3d Air Transport Wing)	Cam de Betarz Erdmann Risch Penkert	Norway, assigned to Chief of Training 5 May 1940, Crete, the Russian front, assigned to Commander in Chief South, Stalingrad, Kuban River, the Russian front, Kurland, Breslau
103d Bombardment Group for Special Employment	Wagner** Ingenhofen**	Norway, disbanded 5 May 1940
104th Bombardment Group for Special Employment (II Group, 5th Air Transport Wing)	von Jena* Stephan* (as II Group, 5th Air Transport Wing)	Norway, Holland, assigned to Chief of Training, Greece (1941), converted to Go-244's (March 1942), converted to Me-323's (November 1942), assigned to Commander in Chief South (February 1943)

<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
105th Bombardment Group for Special Employment (IV Group, 4th Air Transport Wing)	Dannenberg Wenning Defner Jakob Koegl Herbst Schneidenberger Mersmann	Norway, Holland, France, assigned to Chief of Training, Rumania, Crete, central sector of the Russian front, Stalingrad
106th Bombardment Group for Special Employment (III Group, 2d Air Transport Wing)	Stoll Hornung Dudeck Reimann	Norway, Holland, France, half of the group assigned to Instrument Flight School at Insterburg, Crete, converted to Go-244's (March 1942), reconverted to Ju-52's (summer 1942), assigned to Commander in Chief South (February 1943), Crimean Peninsula, Budapest, Breslau
107th Bombardment Group for Special Employment	Foerster von Jena Zaehr Loew	Norway, disbanded in June 1940 after Narvik--parts of the group being re-assigned to the 108th
108th Bombardment Group for Special Employment (20th Air Transport Group)	Krause *** Hammer Zaehr	Norway (until the end of the war)
I Group, 172d Bombardment Wing for Special Employment (IV Group, 3d Air Transport Wing)		Poland, Norway, Holland, France, part of the group assigned to 6th Instrument Flight School at Radom, Crete, Demyansk, southern sector of the Russian front, Stalingrad, Kuban River, Crimean Peninsula, the Russian front

<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
II Group, 172d Bombardment Wing for Special Employment	Babekul Risch Penkert	Poland, Norway, part of the group assigned to 6th Instrument Flight School at Radom, Crete
9th Bombardment Group for Special Employment (I Group, 3d Air Transport Wing)	Jansen Jaeckel Ellerbrock Matschulat Ellerbrock	Poland, Holland, France, Sicily, the Russian front, Stalingrad, Kuban River, the Russian front, Prague at the end of the war
11th Bombardment Group for Special Employment	von Hornstein	Holland, disbanded immediately afterwards
12th Bombardment Group for Special Employment	Krause	Holland, disbanded immediately afterwards
50th Bombardment Group for Special Employment (II Group, 3d Air Transport Wing)	Krahl von Prince Kobs Baumann	Greece, southern sector of the Russian front, Stalingrad, Kuban River, southern sector of the Russian front, Cherkassy, Crimean Peninsula, Breslau, Berlin, parachute operations at Monschau during the Ardennes offensive (December 1944), Berlin, Schleswig-Holstein at the end of the war
40th Bombardment Group for Special Employment	Deutsch	Crete, disbanded immediately afterwards
60th Bombardment Group for Special Employment	Hammer***	Crete, disbanded immediately afterwards



<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
Air Liaison Group	Krause	the Russian front (at Demyansk as the 4th Bombardment Group for Special Employment), assigned to the Fourth Air Fleet (July 1942) for service on the southern sector of the Russian front
Air Transport Squadron (Sea)	?	the Mediterranean, Africa, assigned to the Air Commander (Atlantic) in the beginning of 1943
300th Bombardment Group for Special Employment	Schlosser Damm Gundelfinger Schwanberg Fabiunke	assigned to Commander in Chief South as replacement group (March 1943)
400th Bombardment Group for Special Employment (III Group, 4th Air Transport Wing)	Pfister Heyer Wenning Jakobs	assigned to Commander in Chief South for service in Greece and on the Russian front
500th Bombardment Group for Special Employment (I Group, 4th Air Transport Wing)	Beckmann Koegl Penkert Maus Schneidenberger Mersmann	assigned to Commander in Chief South, Demyansk (as the Bombardment Group Oels), redesignated 500th (April 1942), Stalingrad, Crimean Peninsula, Greece
600th Bombardment Group for Special Employment	Zeidler	the Russian front, Demyansk, assigned to Commander in Chief South, Stalingrad

<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
700th Bombardment Group for Special Employment (equipped with Leo-451's)	Muggenthaler Hannss	the Russian front, Demyansk, southern sector of the Russian front, Stalingrad, converted to Leo-451's in Le Bourget in 1943, conversion incomplete, disbanded in the summer of 1944
800th Bombardment Group for Special Employment (II Group, 2d Air Transport Wing)	Kalepy Reimann	the Russian front, Demyansk, assigned to Commander in Chief South, Stalingrad, Crimean Peninsula
900th Bombardment Group for Special Employment	Ingenhofen** Bittner Wuebben	the Russian front, Demyansk, southern sector of the Russian front, Stalingrad, conversion to Me-323's as III Group, 5th Air Transport Wing, not completed (March 1943)
999th Bombardment Group for Special Employment	Jaeckel*	the Russian front, Demyansk, disbanded in April 1942
5th Bombardment Group for Special Employment (30th Air Transport Group)	Zahn* Uhl Schellmann Hornung Banning* Klamke* Langer	Demyansk, southern sector of the Russian front, Stalingrad, assigned to Commander in Chief South, with First Panzer Army, France, bases in the Atlantic until May 1945, Salzburg at the end of the war
6th Bombardment Group for Special Employment	?	Demyansk, disbanded at the end of March 1942
7th Bombardment Group for Special Employment	?	Demyansk, disbanded at the end of March 1942

<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
8th Bombardment Group for Special Employment	Damm	Demyansk, disbanded at the end of April 1942
Mail Squadron (consisting of six Ju-52's)	Joos	stationed at Biala Podlaska
S-7th Bombardment Group for Special Employment	Grons Heyer	assigned to Commander in Chief South, disbanded in January 1943--part of it being reassigned to the 400th
S-11th Bombardment Group for Special Employment	?	assigned to Commander in Chief South, disbanded in December 1942
S-13th Bombardment Group for Special Employment	Mueller	assigned to Commander in Chief South, disbanded in December 1942
Bombardment Group Frankford for Special Employment	Kuppschuss Hornung	assigned to Commander in Chief South, disbanded in February 1943--part of it being reassigned to the 106th
Bombardment Group Wittstock for Special Employment	Damm Schwannenberg	assigned to Commander in Chief South, disbanded in February 1943--part of it being reassigned to the 300th (replacement group)
20th Bombardment Group for Special Employment (equipped with He-111's)	?	the Russian front, Stalingrad, used as a tow group (April 1943)
21st Bombardment Group for Special Employment (equipped with Ju-86's)	?	Stalingrad, disbanded in March 1943

<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
22d Bombardment Group for Special Employment (equipped with Ju-86's)	?	Stalingrad, disbanded in March 1943
23d Bombardment Group for Special Employment (equipped with He-111's)	?	Stalingrad, used as a tow group (April 1943)
Bombardment Group Posen for Special Employment	Beckmann	Demyansk (as the reinforced--to 70 aircraft--IV Group of the 1st Air Transport Wing, under the name Bombardment Group Posen), resumed old designation in April 1942)
Bombardment Group Oels for Special Employment	Beckmann	Demyansk (as the reinforced 500th Bombardment Group, under the name Bombardment Group Oels), resumed old designation in April 1942
Ju-352 Group (partial strength)	Maus	East Prussia, Kurland, Schleswig-Holstein at the end of the war
1st Air Transport Wing (Ju-52's)	Jaeckel Koegl	
2d Air Transport Wing (Ju-52's)	Erdmann	
3d Air Transport Wing (Ju-52's)	Beckmann Schroeder Hornung	
4th Air Transport Wing (Ju-52's)	Kuppschuss Reimann*	

<u>Designation</u>	<u>Commanders</u>	<u>Theaters of Operation</u>
5th Air Transport Wing (Me-323's)	Damm Neundlinger	
1st Airlanding Wing	Wilke Dr. Eggert	
I Group, 1st Airlanding Wing	Stein Dr. Eggert	
II Group, 1st Airlanding Wing	Willerding Pfister	
III Group, 1st Airlanding Wing	Kuppschuss Lange	
2d Airlanding Wing	Kuppschuss	
I Group, 2d Airlanding Wing	Schweitzer	
II Group, 2d Airlanding Wing	Fae	
Large-Capacity Glider Unit (3 squadrons, each with 6 Me-321 Gigant's, and an engine-driven squadron of 4 elements of Me-110's)	Morzik, XI Air Corps	disbanded in December 1941
Towing Groups and Squadrons (DFS-230's and Go-242's; engine-driven towing squadrons equipped with He-45's, Hs-126's, Ju-52's, He-111's, and Do-17's)	Dr. Eggert, XI Air Corps	

Theaters of Operation

assigned to Commander in Chief South, special assignments, with Baumbach's staff

Commanders

Braun  
Wasserkampf

Designation

Large-Capacity Transport Squadron (equipped with Ju-90's, Ju-290's, Ju-390's, Ar-232's, and Pia 108-T's)

- \* Died in action.
- \*\* Died in action, Russian front, 1941.
- \*\*\* Died in action, 1942.

## Appendix 2

## THE AIR TRANSPORT FORCES AS OF 25 APRIL 1945

<u>Command Staffs</u>	<u>Headquarters</u>	<u>Subordinate To:</u>	<u>Aircraft Strength</u>
Wehrmacht Chief of Air Transport	Berchtesgaden	Quartermaster General, Luftwaffe High Command	
Air Transport Chief, Sixth Air Fleet	Prague	8th Air Corps	
Air Transport Chief, Air Fleet Reich	Rerik	Air Fleet Reich	
-----			
<u>Units</u>	<u>Headquarters</u>	<u>Subordinate To:</u>	<u>Aircraft Strength</u>
1st Group, 1st Air Transport Wing (one squadron)	Windau	Luftwaffe Command (Kurland)	11 Ju-52's
1st Group, 1st Air Transport Wing, 2d and 3d Squadrons and staff	Tutow	Air Fleet Reich	14 Ju-52's
2d Group, 1st Air Transport Wing, 3d Squadron	Puettnitz	Air Fleet Reich	15 Ju-52's (overwater transports)
2d Group, 2d Air Transport Wing	Shrasslavitz	8th Air Corps	32 Ju-52's
3d Group, 2d Air Transport Wing	Klattau	8th Air Corps	
1st Group, 3d Air Transport Wing	Neuenburg	8th Air Corps	24 Ju-52's

<u>Units</u>	<u>Headquarters</u>	<u>Subordinate To:</u>	<u>Aircraft Strength</u>
2d Group, 3d Air Transport Wing	Guestrow	Air Fleet Reich	34 Ju-52's
3d Group, 3d Air Transport Wing	Wimbach	Hq, Fourth Air Fleet	37 Ju-52's
20th Air Transport Group	Oslo	Luftwaffe General (Norway)	38 Ju-52's
1st and 2d Squadrons, 30th Air Transport Group	Neubiberg	Luftwaffe Command (West)	16 He-111's
3d Squadron (RR), * 30th Air Transport Group, and Group Uhl	Rerik	Air Fleet Reich	27 He-111's
Long-Range Air Transport Group	Tutow	Air Fleet Reich	23 Ju-352's
200th Air Transport Squadron	Hoersching	Hq, Fourth Air Fleet	2 FW-200's
40th Air Transport Squadron	Ainring	Sixth Air Fleet	3 helicopters, 3 aircraft equipped with Flettner servo rudder
2d Air Transport Squadron (Sea)	Hommelolik	Luftwaffe General (Norway)	7 Ju-52's (overwater transports)
Staff, 4th Bomber Wing, and 1st Group, 4th Bomber Wing	Koeniggraez	8th Air Corps	25 He-111's
2d Group, 4th Bomber Wing	Greifswald	Air Fleet Reich	28 He-111's

\* The "RR" squadrons were especially trained and equipped for employment against railway targets.



<u>Units</u>	<u>Headquarters</u>	<u>Subordinate To:</u>	<u>Aircraft Strength</u>
3d Group, 4th Bomber Wing	Koeniggraetz	8th Air Corps	23 He-111's
1st, 2d, and 3d Squadrons, 1st Aircraft Tow Group	Koeniggraetz	8th Air Corps	3 Ju-87's, 11 Do-17's, 15 He-111's, 13 DFS-230's, 6 Go-242's

## Appendix 3

LIST OF EQUIVALENT LUFTWAFFE  
AND USAF GENERAL OFFICER RANKS\*

Reichsmarschall des Grossdeutschen Reiches (Goering's rank: Reichs Marshal of the Pan-German Reich)	No equivalent
Generalfeldmarschall	General of the Air Force (Army)
Generaloberst	General
General der Flieger (der Flak, etc.)	Lieutenant General
Generalleutnant	Major General
Generalmajor	Brigadier General

The initials a. D. [ausser Dienst] given between an officer's rank and his name indicate "retired" status.

---

\* These equivalent ranks apply only to World War II. The new German Air Force follows the American pattern; for instance, a Major General in the new GAF is called a Generalmajor, a Lieutenant General is a Generalleutnant.

## Appendix 4

## LIST OF GAF MONOGRAPH PROJECT STUDIES

## I. Published

<u>Study No.</u>	<u>Title</u>
167	German Air Force Airlift Operations
173	The German Air Force General Staff
175	The Russian Air Force in the Eyes of German Commanders
189	Historical Turning Points in the German Air Force War Effort

## II. To Be Published at a Later Date

150	The German Air Force in the Spanish War
151	The German Air Force in Poland
152	The German Air Force in France and the Low Countries (including Airlanding Operations in Belgium and the Netherlands)
153-155	The German Air Force versus Russia on the Eastern Front
156	The Battle of Britain
157	Operation Sea Lion
158-160	The German Air Force versus the Allies in the West
161	The German Air Force versus the Allies in the Mediterranean
162	The Battle of Crete
163 & 165	German Air Force Close Support and Air Interdiction Operations

<u>Study No.</u>	<u>Title</u>
164	German Air Force Air Defense Operations
166	German Air Force Counter Air Operations
168	German Air Force Air-Sea Rescue Operations
169	Training in the German Air Force
170	Procurement in the German Air Force
171	Intelligence in the German Air Force
172	German Air Force Medicine
174	Command and Leadership in the German Air Force (Goering, Milch, Jeschonnek, Udet, Wever)
176	Russian Patterns of Reaction to the German Air Force
177	Russian Use of Airlift to Supply Partisan Forces
178	Problems of Fighting a Three-Front Air War
179	Problems of Waging a Day and Night Defensive Air War
180	The Problem of the Long-Range Night Intruder Bomber
181	The Problem of Air Superiority in the Battle with Allied Strategic Air Forces
182	Fighter-Bomber Operations in Situations of Air Inferiority
183	Analysis of Specialized Anglo-American Techniques
184	Effects of Allied Air Attacks on German Divisional and Army Organizations on the Battle Fronts
185	Effects of Allied Air Attacks on German Air Force Bases and Installations

<u>Study No.</u>	<u>Title</u>
186	The German Air Force System of Target Analysis
187	The German Air Force System of Weapons Selection
188	German Civil Air Defense
190	The Organization of the German Air Force High Command and Higher Echelon Headquarters within the German Air Force